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ABSTRACT

This special issue of "Science Education" is designed to provide a research tool for science education researchers and students as well as information for science teachers and other educational practitioners who are seeking suggestions about science teaching objectives, curricula, instructional procedures, science equipment and materials or student assessment instruments. It consists of 3 divisions: (1) science teaching; (2) research and special interest areas; and (3) journal features. The science teaching division which contains listings of practitioner-oriented articles on science teaching, consists of five sections. The second division is intended primarily for science education researchers who are doing a literature search, and it consists of nine sections, each of which relates to a particular research or special interest area in science education. The third index division, which consists of citations in the special features of the journal, is intended for researchers carrying out historical studies in science teaching and science education. An article which contains an illustration of how questions of contemporary interest can be traced historically by using enteries in this index is also included. (HM)

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CUMULATIVE INDEX TO science education

Volumes
1 through 60
1916–1976

Audrey B. Champagne

Leopold E. Klopfer

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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CUMULATIVE INDEX TO SCIENCE EDUCATION

Volumes 1 through 60
1916–1976

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2. Textbooks for the High School Student
a. Biology and Applied Biology (includes agriculture, domestic science, and hygiene)
b. Laboratory Manuals for Biology and Applied Biology
c. Chemistry and Applied Chemistry
d. Laboratory Manuals for Chemistry and Applied Chemistry
e. Earth Science
f. Laboratory Manuals for Earth Science
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h. Laboratory Manuals for Physical Science
i. Physics and Applied Physics (includes electronics, radio, and shop)
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a. Biology and Applied Biology (includes agriculture, conservation, ecology, medicine, nursing, and nutrition)
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   e. Zoology—Reptiles and Amphibians
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   g. Zoology—Birds
   h. Zoology—Mammals
   i. Medicine and Physiology
   j. Genetics and Heredity
   k. Paleontology and Evolution
   l. General Biology
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   o. Agriculture, Domestic Science, and Forestry
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   Note: Listings in each of the following categories are divided into (1) books for children and (2) books for young adults and adults.
   a. General Physical Science
   b. Physical Science—Atomics and Structure of Matter
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   e. General Physics (includes mechanics, energy and heat, light, sound and applications)
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INTRODUCTION

Our original purpose in compiling a cumulative index for *Science Education* was to provide a research tool for students of science education. That purpose did not change as the compilation project progressed, but we did learn that the sixty volumes of the journal were sources for a greater diversity of information than we at first had realized. Beginning in 1916 as the *General Science Quarterly*, the journal's earliest primary audience was the teachers of the then recently devised General Science courses in the secondary schools and the newly evolving junior high schools. In later volumes of the journal, the audience addressed through its articles and features also included elementary school teachers, science supervisors, science education researchers, science teacher educators, high school teachers of biological and physical sciences, and college instructors of general education courses in science. Some segments of this diverse audience apparently looked to the journal for practical procedures, methods, materials, plans, and resource information for teaching science, while others probably were more concerned about the organization of science curricula and teacher preparation programs or about the systematic investigation of learning, instruction, evaluation, and other aspects of science education. The sixty volumes of *Science Education* contain copious information about all these matters, and more.

In the course of our own studies in science education, we often had occasion to draw upon the resource of information and ideas contained in *Science Education.* But doing so was laborious, for it generally involved searching through the indices of many individual volumes to find the items of interest. A single cumulative index, classified by areas that are commonly of concern to many science educators, should reduce the searching time significantly and, thereby, make the desired information more accessible. That is how we hope this cumulative index to *Science Education* will be of service to fellow students of science education. We envision that this index will be useful for (1) science education researchers who wish to have ready access to the background literature on a particular research topic; (2) teachers of science and other educational practitioners who are seeking suggestions about science teaching objectives, curricula, instructional procedures, science equipment and materials, or student assessment instruments; and (3) researchers who are carrying out historical studies of science teaching and science education in the 20th century.

The bibliographic needs of these three groups dictated what the main divisions for organizing the index would be, but the actual contents of the journal determined the sections that were included in each division. For the largest part of the journal's existence, its contents were intended to be directly useful for educational practitioners concerned with the teaching of science. Consequently, our first division in the index contains listings of practitioner-oriented articles on science teaching. This division consists of five sections, as described in the Table of Contents. The second division is intended primarily for science education researchers who are doing a literature search, and it consists of nine sections, each of which relates to a particular research or special interest area in science education. In designating the nine areas for the sections of this division (see Table of Contents), we have sought to reflect those areas of research and interest that are prominent in science education at the present time.

The third index division, which consists of citations in the special features of the journal, will be of particular interest to researchers carrying out historical studies in science teaching and science education. While such historical studies probably would focus on

one or several topics in the sections of the first and second divisions, the journal features indexed in the third division are a valuable additional resource. The journal features include abstracts of contemporary articles appearing in *other* journals and periodicals; reviews of science textbooks, science trade books, and various other reference and trade books; editorials and editorial comments; and meeting announcements, reports, and minutes of minutes of meetings for several science education associations. More than 2900 abstracts appeared in Volumes 14 through 33 of the journal and more than 6700 books were reviewed throughout the sixty volumes, but space considerations did not allow us to list all the abstracts and book reviews in the cumulative index. Hence, we had to make a judicious selection of abstracts and book reviews, as explained at the beginning of each of these sections. Nevertheless, the journal features division of the index is about as large as the other two index divisions combined.

A descriptive Table of Contents for this index appears on pp. iii–viii to provide the user with an overview of the organizing principles we have employed in presenting the references to articles and journal features in the sixty volumes of *Science Education.*

We are pleased that it has been possible to reprint in this volume (pp. xi–xxxii) our article, "A Sixty-Year Perspective on Three Issues in Science Education," which contains an illustration of how questions of contemporary interest can be traced historically by using entries in this *Cumulative Index.* [This article originally appeared in *Science Education* 61:431–452 (1977).]

Acknowledgments

This cumulative index could not have come into existence without the efforts of an exceptional educational bibliographer, Scott D. Koziol. We are very grateful for her insightful, conscientious, and continually cheerful work on this lengthy project.

We want to express our appreciation for their helpful cooperation to the librarians in the Hillman Library, University of Pittsburgh, and in the Science and Technology Section, Carnegie Library of Pittsburgh.

For their good natured assistance on a variety of tedious clerical tasks, we are indebted especially to Alexandra Antoniewicz, Joan Donnelly, and to many other helpers. Page layouts and graphics were skillfully executed by Donna Rottman.

For accomplishing the tremendous task of typing the index, we wish to particularly thank Patricia Stanton.

A.B.C.
L.E.K.

A Sixty-Year Perspective on Three Issues in Science Education: I. Whose Ideas Are Dominant? II. Representation of Women. III. Reflective Thinking and Problem Solving

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Learning Research and Development Center, University of Pittsburgh, Pittsburgh, Pennsylvania 15260

The nation's bicentennial provided the impetus for a good deal of historical reflection and for a multitude of commemorative events. Coinciding with the 200th anniversary year of the nation's birth was a memorable milestone in the life of the journal, *Science Education*, in that 1976 marked the completion of the publication of sixty continuous volumes.* This occasion was appropriately commemorated in Milton Pella's appreciative and reflective editorial that headed Issue 4 of Volume 60[1]. Our own contribution to the celebration of the occasion was the preparation of a cumulative index for the sixty volumes of *Science Education*, 1916–1976[2].

Undertaking such a mammoth bibliographic task should have a greater purpose than merely commemorating a publishing milestone. Moreover, the production of a cumulative index in itself is not the kind of research activity that we value highly. This is not meant to imply that we are unappreciative of the efforts of those conscientious persons who labor long and hard to prepare good cumulative indices that become important tools for the students in a field. Such facilitating work is clearly necessary in any field which is the object of serious study. By making available a cumulative index for *Science Education*, we would like to encourage students in the field of science education to become more deeply informed about their research topics and to seek more comprehensive documentation for their studies than is frequently the case at present. Another purpose for our preparing this cumulative index is to make a modest contribution toward the encouragement of historical studies in science education. We believe that historical studies which are firmly grounded in good data can provide exceedingly valuable perspectives on many issues that confront science education today.

It is not difficult to imagine how a cumulative index could be used in historical studies both as a source of data and as a route to additional data. The section titles that we em-

* No other periodical publication devoted exclusively to education in science has a comparable record. *School Science and Mathematics* began publication in 1901 as *School Science* and continues today, but it has not been exclusively devoted to science education. The *Cornell Rural School Leaflet* (later called *Cornell Science Leaflet*) was founded in 1906 and dealt only with science, but it expired with Volume 62 in 1969. *Science Education* began as the *General Science Quarterly* in 1916 and adopted its present name in 1929. The next four oldest science education periodicals, which are still being published, are Great Britain's *School Science Review*, begun in 1919; the *Journal of Chemical Education*, begun in 1923; the *American Physics Teacher* (now the *American Journal of Physics*), begun in 1933; and the *American Biology Teacher*, begun in 1938.

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TABLE I
Sections in the *Cumulative Index for Science Education, Volumes 1–60, 1916–1976*

SCIENCE TEACHING	
I.	Aims and Objectives of Science Teaching
II.	Science Curriculum
III.	Instructional Procedures
IV.	Science Equipment, Materials, and Facilities
V.	Science Tests and Assessment Instruments
RESEARCH AND SPECIAL INTEREST AREAS	
VI.	Science Education Research
VII.	Learning Theories and Processes
VIII.	Evaluation of Science Programs
IX.	Science Education History
X.	Teacher Education
XI.	Science and Society
XII.	Scientific Information
XIII.	History of Science
XIV.	Education in General
JOURNAL FEATURES	
XV.	Abstracts
XVI.	Book Reviews
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ployed to organize the *Cumulative Index for Science Education* are listed in Table I. By consulting the entries in a particular section, one can begin to investigate questions such as these: How much attention did science educators give over the 60 year period to the aims and objectives of science teaching? Which themes persisted during this time and which ideas were transitory? How much attention did science educators give in 60 years to the psychology of learning science? Which learning theories and processes were particularly emphasized? How much attention did science educators give in 60 years to problems of testing and student assessment? What solutions were devised for some student assessment problems and how well did they work? Later in this paper we will illustrate how ideas about questions like those just listed can be traced historically by utilizing entries in the *Cumulative Index for Science Education.* Before turning to that illustration, however, we would like to describe how the process of compiling the cumu-

lative index yielded some data which aided in providing a perspective on two current issues in the field of science education.

Whose Ideas Are Dominant in Science Education?

What children learn in schools about science is determined by many factors, not the least of which are the content and form of instruction. Educators generally control these two factors. By educators we mean, first of all, classroom teachers plus supervisors of instruction in education agencies at various levels and staff members associated with education in colleges and universities. Educators are rarely of one mind regarding what the content and form of instruction in schools should be, and this is particularly true in science education. There is a diversity of ideas in the field, and the issue of whose ideas on science education are the most worthy remains unresolved. Although a historical study cannot settle questions of relative worth, it can shed some light on the issue by providing data concerning the sources of the ideas which have been prominent over the course of time.

As we prepared the *Cumulative Index for Science Education,* we took note of the institutional affiliations of all the authors of articles. Each time a person's name appeared either as the sole author or as a co-author of a full article, not including journal features such as abstracts and book reviews, his or her listed affiliation was tallied under one of several categories.* The main categories are:

Elementary and secondary schools. Includes all organizational combinations, e.g., middle school, junior high, academy, junior-senior high school, of grades K–12 and laboratory schools.

Education agencies. Includes school district offices, intermediate units between the district and state levels, state education departments, regional and nationwide associations, and national education agencies, e.g., U.S. Office of Education.

Colleges and universities. Normal schools, which are represented in the earlier volumes, are included in this category. Also included are special educational projects and institutes associated with a college or university.

Other. This interesting category includes industry, medicine, business, publishers, and government agencies other than education agencies. The few authors who had no listed affiliation (less than 0.5%) were also tallied here.

For each volume year, we counted the number of authors in each institutional affiliation category and calculated percentages. The results are shown in Table II. As the data in the table reveal, in the early volumes of *Science Education,* the number of authors affiliated with elementary and secondary schools was, for the most part, larger than the number of authors in colleges and universities. The mean percentages for volumes 1–10 are, respectively, 42 and 36%. In subsequent volumes the number of practitioner authors from elementary and secondary schools never again exceeds the number of authors from

* To be precise, our tallying procedure recorded the number of authorships of articles, not the number of different authors. Thus, for any person who authored more than one article in *Science Education,* his or her affiliation was tallied once for each such authorship. This straightforward procedure was used because the purpose for recording the data was simply to obtain information about the proportions of contributions to *Science Education* from persons in several institutional affiliation categories. Since the same rule for tallying was applied to persons in all affiliation categories, the proportions derived from the number of authorships can be expected to be nearly identical with the proportions derived from the number of different authors. We chose the straightforward procedure of tallying the number of authorships and did not attempt to reduce this to the number of different authors, thereby saving much arduous and needless work.

TABLE II

Affiliations of Authors of Articles in *Science Education*, Volumes 1–60, 1916–1976

Volume No.	Number of Authors	El. & Sec. Schools No.	El. & Sec. Schools Pct.	Education Agencies No.	Education Agencies Pct.	Colleges & Universities No.	Colleges & Universities Pct.	Other No.	Other Pct.
1	42	21	50.0	4	9.5	15	35.7	2	4.8
2	29	13	44.8	1	3.5	10	34.5	5	17.2
3	29	8	27.6	3	10.3	13	44.8	5	17.2
4	29	13	44.8	2	6.9	11	37.9	3	10.3
5	27	10	37.0	1	3.7	9	33.3	7	25.9
6	42	11	26.2	4	9.5	17	40.5	10	23.8
7	22	10	45.5	1	4.6	9	40.9	2	9.1
8	26	13	50.0	0	0.0	6	23.1	7	26.9
9	31	15	48.4	2	6.5	7	22.6	7	22.6
10	21	9	42.9	2	9.5	9	42.9	1	4.8
11	23	7	30.4	3	13.0	11	47.8	2	8.7
12	27	8	29.6	1	3.7	17	62.9	1	3.7
13	36	11	30.6	3	8.3	20	55.6	2	5.6
14	38	9	23.7	5	13.2	18	47.4	6	15.8
15	33	7	21.2	6	18.2	19	57.9	2	6.1
16	61	14	23.0	7	11.5	34	55.7	6	9.8
17	51	12	23.5	6	11.8	28	54.9	5	9.8
18	43	17	39.5	4	9.3	21	48.8	1	2.3
19	30	8	26.7	2	6.7	20	66.7	0	0.0
20	37	9	24.3	5	13.5	23	62.2	0	0.0
21	31	7	22.6	8	25.8	16	51.6	0	0.0
22	58	22	37.9	2	3.5	31	53.5	3	5.2
23	62	24	38.7	7	11.3	25	40.3	6	9.7
24	76	25	32.9	11	14.5	36	47.4	4	5.3
25	77	25	32.5	7	9.1	33	42.9	12	15.6
26	31	11	35.5	3	9.7	15	48.4	2	6.5
27	30	8	26.7	1	3.3	18	60.0	3	10.0
28	68	15	22.1	9	13.2	36	52.9	8	11.8
29	37	9	24.3	1	2.7	23	62.2	4	10.8
30	39	16	41.0	3	7.7	16	41.0	4	10.3
31	52	7	13.5	3	5.8	33	63.5	9	17.3
32	46	10	21.7	3	6.5	28	60.9	5	10.9
33	59	11	18.6	5	8.5	38	64.4	5	8.5
34	52	7	13.5	2	3.9	41	78.9	2	3.9
35	59	12	20.3	2	3.4	41	69.5	4	6.8
36	53	13	24.5	2	3.8	36	67.9	2	3.8
37	42	1	2.4	2	4.8	39	92.9	0	0.0
38	46	4	8.7	5	10.9	35	76.1	2	4.4
39	52	3	5.8	5	9.6	42	80.8	2	3.9
40	81	12	14.8	11	13.6	57	70.4	1	1.2
41	68	7	10.3	6	8.8	50	73.5	5	7.4
42	91	15	16.5	13	14.3	59	64.9	4	4.4
43	85	16	18.8	9	10.6	56	65.9	4	4.7
44	79	9	11.4	8	10.1	61	77.2	1	1.3
45	103	15	14.6	10	9.7	74	71.9	4	3.9
46	106	12	11.3	8	7.6	81	76.4	5	4.7
47	109	12	11.0	9	8.3	80	73.4	8	7.3
48	82	7	8.5	11	13.4	60	73.2	4	4.9
49	107	16	15.0	8	7.5	77	72.0	6	5.6
50	102	14	13.8	11	10.8	70	68.6	7	6.9
51	110	9	8.2	2	1.8	98	89.1	1	0.9
52	99	5	5.1	10	10.1	81	81.8	3	3.0
53	114	11	9.7	3	2.6	95	83.3	5	4.4
54	92	10	10.9	7	7.6	75	81.5	0	0.0
55	101	1	1.0	7	6.9	93	92.1	0	0.0
56	94	0	0.0	6	6.4	87	92.6	0	0.0
57	78	0	0.0	2	2.6	75	96.2	1	1.3
58	111	3	2.7	5	4.5	103	92.8	0	0.0
59	121	7	5.8	9	7.4	105	86.8	0	0.0
60	97	2	2.1	3	3.1	92	94.9	0	0.0

colleges and universities. After Volume 30 (1946), the erosion of contributions to *Science Education* from practitioners in schools becomes particularly marked. Concurrently the number of college and university authors per volume markedly rises. For volumes 51–60, the mean percentage of authors from schools is less than 5%, while it is 89% for college and university authors. The shift in the institutional affiliations of *Science Education* authors between the journal's early years and the 1970s can be characterized as no less than dramatic.

Science educators affiliated with education agencies may be thought of as practitioners who are once or twice removed, depending on their agency's level, from the daily happenings in the classroom. On the whole, these practitioners have contributed a small but fairly steady percentage of authorships per volume of *Science Education* throughout its 60 years. In volumes 1–10, the mean percentage of authors affiliated with education agencies is 6%; in volumes 51–60, it is 5%. These percentages are certainly not large, but they are impressive when considered in relation to the percentages for authors who are teachers in schools. The number of persons teaching science in schools exceeds the number of science educators in various education agencies by at least a factor of 20. Yet, in the most recent ten-year period, there were about as many education agency authors of *Science Education* articles as there were teacher authors. Science educators in education agencies can hardly be considered a silent minority.

Another interesting observation that can be made from Table II concerns the extent of contributions made by authors in the "Other" category. In most of the earliest volumes of *Science Education,* there were more authors from this group than authors in education agencies. The mean percentage for volumes 1–10 is nearly 16%. Thereafter the percentage of authors per volume in the "Other" category declines, but lingers on at a respectable level in several years, notably during and after the World War II era covered by volumes 25–32 (1941–1948). However, for volumes 51–60, the mean percentage has dropped to less than 1%. We suspect that the diminution and eventual disappearance of contributions to *Science Education* from authors outside education is a reflection of the growing "professionalization" of science education. As this process proceeds, more and more professionals in the field must publish their work and their ideas, so that soon little space remains in the profession's journal for outsiders.

Our data have also shown that space in *Science Education* has been increasingly devoted to the publications of science education professionals affiliated with colleges and universities. To the extent that publication in the profession's journal is an index of whose ideas are most prominent, science educators at colleges and universities are virtually uncontested today. As measured by the ratio of publication in *Science Education,* the ideas of teachers in schools are but rarely heard. This has not always been so. Our survey of the affiliations of *Science Education* authors indicates that in former years more equity in the opportunity to express ideas prevailed among educators in colleges and universities, educators in education agencies, and educators who teach science to children in schools. Whether or not the present situation is most beneficial for the science education of these children is something to consider.

Representation of Women in Science Education

The recognition of women's equality and right to equal opportunities in all affairs of life is a significant issue throughout the fabric of today's society. So, too, is it a pressing

TABLE III

Sex of Educator Authors of Articles in *Science Education*, Volumes 1–60, 1916–1976

Volume No.	Year	Number of Educator Authors	Female No.	Female Pct.	Male No.	Male Pct.	Unidentified
1	1916-17	40	0	0.0	38	95.0	2
2	1917-18	24	2	8.3	19	79.2	3
3	1918-19	24	5	20.8	19	79.2	0
4	1919-20	26	7	26.9	17	65.4	2
5	1920-21	20	2	10.0	16	80.0	2
6	1921-22	32	16	50.0	15	46.9	1
7	1922-23	20	1	5.0	18	90.0	1
8	1923-24	19	2	10.5	14	73.7	3
9	1924-25	24	7	29.2	14	58.3	3
10	1925-26	20	2	10.0	18	90.0	0
11	1926-27	21	0	0.0	19	90.5	2
12	1927-28	26	4	15.4	22	84.6	0
13	1928-29	34	6	17.7	16	47.1	2
14	1929-30	32	5	15.6	26	81.3	1
15	1930-31	31	7	22.6	23	74.2	1
16	1931-32	55	7	12.7	47	85.4	1
17	1933	46	6	13.0	39	84.8	1
18	1934	42	5	11.9	36	85.7	1
19	1935	30	5	16.7	24	80.0	1
20	1936	37	4	10.8	32	86.5	1
21	1937	31	6	19.4	25	80.7	0
22	1938	55	9	16.4	45	81.8	1
23	1939	56	12	21.4	43	76.8	1
24	1940	72	14	19.4	52	72.2	6
25	1941	65	13	20.0	49	75.4	3
26	1942	29	9	31.0	20	69.0	0
27	1943	27	5	18.5	20	74.1	2
28	1944	60	12	20.0	48	80.0	0
29	1945	33	4	12.1	29	87.9	0
30	1946	35	3	8.6	32	91.4	0
31	1947	43	8	18.6	35	81.4	0
32	1948	41	11	26.8	30	73.2	0
33	1949	54	2	3.7	52	96.3	0
34	1950	50	3	6.0	47	94.0	0
35	1951	55	5	9.1	50	90.9	0
36	1952	51	10	19.6	41	80.4	0
37	1953	42	4	9.5	37	88.1	1
38	1954	44	5	11.4	39	88.6	0
39	1955	50	10	20.0	40	80.0	0
40	1956	80	9	11.3	70	87.5	1
41	1957	63	7	11.1	55	87.3	1
42	1958	87	9	10.3	78	89.7	0
43	1959	81	13	16.1	68	83.9	0
44	1960	78	7	9.0	71	91.0	0
45	1961	99	17	17.2	82	82.8	0
46	1962	101	14	13.9	86	85.2	1
47	1963	101	17	16.8	84	83.2	0
48	1964	78	18	23.1	56	71.8	4
49	1965	101	11	10.9	87	86.1	3
50	1966	95	15	15.8	77	81.1	3
51	1967	109	9	8.3	96	88.1	4
52	1968	96	10	10.4	85	88.5	1
53	1969	109	13	11.9	93	85.3	3
54	1970	92	11	12.0	80	87.0	1
55	1971	101	12	11.9	83	82.2	6
56	1972	94	7	7.5	79	84.0	8
57	1973	77	11	14.3	65	84.4	1
58	1974	111	11	9.9	98	88.3	2
59	1975	121	19	15.7	97	80.2	5
60	1976	93	11	11.3	82	84.5	4

issue in the field of science education where, as in many other areas concerned with the teaching of children, women have long been well represented. But, it is the levels at which women are involved in science education that is the issue, and whether or not women have equal opportunities to influence science education other than as classroom teachers. In the process of preparing the *Cumulative Index for Science Education,* we were able to compile some data which provide a historical perspective on this issue. We employed the same procedure for compiling the data as was used for tallying the affiliations of authors of full articles in *Science Education.* Authors whose affiliation was in the "Other" category were not counted, since our interest here was on female and male representation within science education. Judging by the given name of each educator author, we recorded whether the person was female, male, or unidentified. A considerable difficulty arose in those cases where only the person's initials and family name were listed, and we found it necessary to consult various other sources and references to reduce the number of persons in the unidentified category.* Table III displays the number and percent of female and male educator authors, and the number whose sex still remains unidentified, in each of the 60 volumes of *Science Education.*

According to our data, the percentage of female authors in a single volume ranges from a high of 50% to a low of 0%. The median for all 60 volumes is 13%. However, the percentages are not evenly distributed across different time periods, and they show a generally *decreasing* trend from the earliest ten-year period to the latest. For volumes 1–10, the mean percentage is 17%, while for volumes 51–60, it is 11%. On the assumption that being an author in the profession's journal is an index of the degree to which an individual exerts influence on the wider field of science education, these data show that women had more opportunity to be more widely influential in the earlier years of *Science Education* than in the most recent years. Measured in relation to the male authors in the profession's journal, women in science education appear to have sustained a slight loss in influence as the years have gone by.

Reflective Thinking and Problem Solving

We mentioned before that educators rarely agree on which content and form of instruction is the best, but there is one aspect of science instruction where there is a remarkable degree of agreement in the professed beliefs of today's science educators. It is the belief that reflective thinking and problem solving have an important place in children's learning of science in school. Nonetheless, this common belief is all too often not manifested in school practice. A contemporary issue of some magnitude in science education is this disparity between belief and practice regarding reflective thinking and problem solving. In this section, we shall attempt to provide a perspective on this issue

* Sources used to find complete names of authors included, among others, the volumes of the *Readers Guide to Periodical Literature* and the *Education Index,* Library of Congress catalog cards, and published membership lists and annual meeting programs of the National Association for Research in Science Teaching. In a few instances, we made an informed inference about the person's sex on the basis of institutional affiliation and title, e.g., a principal of a high school in the 1920s was identified as a male, since virtually no females were high school principals then. Sometimes an individual's given name alone (e.g., Leslie) was not sufficient to make a decision about the person's sex, and such instances were left as unidentified unless we had additional information about the person. From the names listed with the articles in the journal, the sex of some 9% of the educator authors was initially in the unidentified category. After our search, the sex of only 2.6% remains unidentified.

through a historical study that was facilitated by employing the *Cumulative Index for Science Education.*

Throughout the 60 volumes of *Science Education,* a pervasive theme is reflective thinking and its external manifestation, innovative problem solving.* It is significant that the man who made this theme pervasive in American education also authored the first article in the first volume of *Science Education,* which was then called *General Science Quarterly.* John Dewey's position is stated briefly but directly in "Method in Science Teaching[4]," that the method of science—problem solving through reflective thinking—should be both the method and valued outcome of science instruction in America's schools. This position was not challenged in the 40 subsequent volumes of the journal. In the following pages we propose to describe and analyze reflective thinking and innovative problem solving as they are represented in the volumes of *Science Education*; to show the extent to which John Dewey influenced this literature and the practice of science education, as it is reflected in *Science Education*; and to document the assertion that, even as the study of innovative problem solving and reflective thinking comes increasingly under the influence of psychology, Dewey's philosophy remains basically unchallenged. Reflective thinking continues to be regarded as a valued outcome for science education.

John Dewey contributed two articles concerning reflective thinking and problem solving to the volumes of *Science Education*; the first, "Method in Science Teaching," appeared in the journal twice[4]. The second time when it appeared in Volume 29, it was preceded by some reflections by its author. Dewey addressed the same theme in a second article, "The Supreme Intellectual Obligation," which appeared in Volume 18[5]. Both of these articles† are devoted to discussions of the value of the method of science and the responsibility of science educators to make the method of science available to all children. "Method in Science Teaching," an address delivered before the Science Section of the National Education Association, contains a reaffirmation of John Dewey's faith in the method of intelligence‡ and states his belief that the teaching of this method should be the aim of science teaching. Dewey asserts that science gives men power because it allows them to test their beliefs and that "science . . . is knowledge at its best, knowledge in its

* There is no explicit attempt in the earlier literature of *Science Education* to define the type of problem to which reference is being made. Although Dewey believed in the application of reflective thinking to cognitive problems in all facets of human endeavour, we have limited our discussion to problems directly related to science. We have added the adjective *innovative* which Getzels[3] uses to set apart higher level cognitive problems from those lower level types of problems which do not require creative thinking for their solution.

† In another of his *Science Education* articles, "Individuality in Education[6]," Dewey touches on problem solving in a brief aside. He mentions one facet of problem solving that is recognized later in the literature as having important implications for problem solving in the schools. Dewey says:

> The teacher believes there is one scientific and proper method of approaching these problems. One child does the problem in a way which diverges from the orthodox conventional method laid down by the text-book, the teacher, or the particular course of study. Instead of recognizing something valuable, something precious, something to be encouraged, the teacher frowns upon the pupil and insists on the adoption of a certain uniform method of arranging the result[6, p. 159].

‡ Dewey asserted this faith on many occasions, both before and after the present article. For example, the book that he addressed to teachers in 1910, *How We Think*, revised in 1933[7], was in a sense an affirmation of Dewey's faith in reflective thinking or the method of intelligence, which "converts action that is merely appetitive, blind, and impulsive into intelligent action[7, p. 17]." See, especially, his discussion of the values of thinking in Chap. 2 of *How We Think*.

tested and surest form[4, p. 3]." He says that "the end of science teaching is to make us aware of what constitutes the most effective use of mind, of intelligence. . . [4, p. 3]."

Consistent with his philosophy, Dewey seeks to obliterate the duality of means and ends and thus asserts that it is "important to see to it that methods of teaching [science] are such as to fulfill its true purpose[4, p. 4]." Here Dewey states unequivocally that elementary education is important in the process of educating reflective thinkers and discusses briefly the methods he believes appropriate. He urges that science teaching should be *dynamic,* truly scientific, because "the understanding of *process* is at the heart of scientific attitude[4, p. 7]." The child should be given the opportunity to construct knowledge, beginning with everyday objects and materials, and to learn from them both the ideas and the method through which they were created. Being derived as it is from the very method of the natural sciences, Dewey's philosophy of science education was then, as it is today, most appealing to science educators. However, Dewey's philosophy has resisted their efforts to translate it into methods of classroom practice that can be readily communicated to teachers. This is due in part to the very nature of the philosophy. Dewey's intent to obliterate the means–end dualism and his view of intellectual activity as an integrated whole resulted in a philosophy that obstructs the kind of analysis necessary to translate it into functional methods and outcomes of sufficient simplicity to be easily communicated to practitioners. Evidence of this difficulty can be found in articles that appeared in *Science Education* between the years 1917 and 1935 on innovative problem solving and reflective thinking.

In the 17 volumes between Dewey's first and second statements on this matter a handful of articles appeared in *Science Education* [e.g., 8–10] which suggest that several science educators had taken on the task of translating Dewey's philosophy and method into classroom practice. It is evident from certain of their writings that, in their search for definition, they had read further into some of Dewey's other works.* They were obviously struggling with the problem of identifying the elements and discovering the distinctions, if any, that exist among reflective thinking, scientific method, scientific problem solving, the method of intelligence, inquiry, and scientific attitude—all of which were terms Dewey used on occasion to describe the ideal of intellectual activity toward which all education should be striving.

Among the articles published in *Science Education* in the early 1930s, five describe attempts to measure the extent to which some facet of Dewey's intellectual ideal has been engendered in students of science. Two articles by Ralph Horton, a chemistry teacher at New York City's Seward Park High School, report on the attempt by Horton and his colleagues to measure outcomes of laboratory experiences other than those measured by written examinations.† The desired outcome is to train students to think, and two methodologies are tested to ascertain their relative effectiveness in producing the desired

* For example, although the five phases of reflective thought are not mentioned in "Method in Science Teaching," they do appear in some of the science educators' writings. As given in Dewey's *How We Think,* the phases of reflective thought are: Suggestion; Intellectualization; the Guiding Idea, the Hypothesis; Reasoning (in the narrower sense); and Testing the Hypothesis by Action [cf., 7, pp. 107–115].

† An interesting aside in this article results from Horton's attempt to attack this problem in educational experimentation as if it were a problem in chemistry. Reasoning by analogy, he asserts that his educational problem is analogous to determining relative yield from two or more chemical reactions, but he concludes somewhat less than cynically that "attempts to apply chemical methods to educational experimentation meet with obstacles[11, p. 312]."

outcome. The problem method, which used chemistry laboratory experiences to train pupils to think through problems, was hypothesized to be superior to the demonstration method on the basis that "learning *to think* and *to do* could be achieved—if at all—only through *opportunity to think and to do* . . . [11, p. 319]."

This study represents a sincere attempt to measure the extent to which Dewey's ideal might be met through the use of laboratory experiences. However, analysis of the study reveals one kind of discrepancy that occurred as attempts were made to operationalize the ideal. Although Horton concludes from his data that the laboratory group performs better on his outcome measures, the instruments used as outcome measures that he describes are tests of written information, the ability to manipulate laboratory equipment, and the ability to set up laboratory apparatus to fulfill a novel combination of specifications. These are instruments that test the ability "to do," rather than the ability to think.

The pitfall facing those who made attempts to operationalize scientific attitude and skills are also evident in the work of Florence Weller[12] of the Institute of School Experimentation at Columbia University's Teachers College. Weller attempted to answer an important question, "What are some of the attitudes and skills we can expect to develop in elementary science[12, p. 91]?" Weller's question was and still is an important one. Not only does it represent a further attempt at definition, but it also asks what may be *possible* to achieve. In retrospect, Weller's attempt at definition and operationalization was no more successful than Horton's. Weller asserted that her instruments tested for scientific attitude and the skills of observation, conclusion, proof or verification, but it is highly unlikely that science educators would agree that they are valid tests of scientific attitude or of these skills.*

Another article during this period reports the results of a study by Sam Strauss [13] to determine the extent to which a sample of Ohio high school students exhibited scientific thinking, as that process is defined by Elliot Downing's test, "Some Elements of Scientific Thinking."† Downing's instrument represents a most careful scholarly attempt to define and operationalize the concept of scientific or reflective thinking. As his source of information about the working of the minds of scientists, Downing used biographies, journals, and letters that scientists, reflecting on their work, had written. On the basis of his analysis of the reflective writings of scientists, Downing compiled a list of the steps of the scientific method,‡ the "hazards encountered at each, and safeguards to be observed at each step to ensure correct conclusions in thought processes[15, p. 121]." These successive steps and necessary safeguards were translated into an instrument designed to test certain of the elements and safeguards:

* The reader may wish to judge the validity of Weller's assertion. For some sample items from Weller's true-false test of attitude and from her multiple-choice test of the skills of observation, conclusion, proof, or verification, see Appendix I.

† It is interesting to note that Strauss's report of his use of Downing's test predates the report by Downing of his own studies using the instrument[14]. These studies are followed some three years later by an article[15] that describes the rationale for and the method of developing the instrument, along with the test itself, the scoring procedures, and analysis of the results.

‡ The list of successive steps and their accompanying safeguards appeared in an article by Downing in *The Scientific Monthly*[16]. The elements listed there and some of the safeguards are given in Appendix II.

1. To test accuracy of observation.
2. To test ability to pick out pertinent elements from a complex situation.
3. To test ability to synthesize.
4. To test selective recall.
5. To test fertility of hypothesis.
6. Does pupil clearly define a problem before trying to solve it?
7. To test ability to hold in mind a complex of relations.
8. To test problem solving ability—all elements at once.
9. To test judgment on adequacy of data.
10. Does pupil solve a problem scientifically or by the trial and error method?
11. Does pupil suspend judgment on mooted questions?
12. Can pupil apply a rule or law?
13. Does pupil test an hypothesis by collecting facts—say, measuring the lines?
14. Is pupil aware of the danger of reasoning by analogy?
15. Can pupil arrange data in sequence to make the conclusions evident[15, p. 127]?

Strauss administered the Downing test to a sample of 1,343 students in grades 8–12 and asked six questions of the data:

Which of the elements of scientific thinking are practiced most? Which least[13, p. 90]?* [Strauss answered this question by comparing the scores students made on each of the elements and assumed that those elements on which the students scored high were practiced more than those on which students scored lower.†]

Do boys think better than girls[13, p. 91]?
[There is no evidence from this administration of the test that they do.]

Does scientific thinking improve with rise in grade status[13, p. 91]?
[There is no evidence from this administration of the test that it does.]

Does scientific thinking improve with increase in chronological age[13, p. 92]?
[There is no evidence from this administration of the test that it does.]

Is there any relationship between general intelligence and the ability to think[13, p. 93]?
[There is no evidence from this administration of the test that the relationship is marked.]

The data collected by Strauss were hardly encouraging and those data collected by Downing[14,15] were no more encouraging than Strauss's. The analysis of the data Downing collected on the administration of his test to over 2,500 students in grades 8–12 led him to conclude that there is

> no evidence in the data given that high school pupils acquire skill in scientific thinking as a necessary by-product of the study of scientific subjects as at present taught[14, p. 89].

* The form of this question is interesting because of its tacit acceptance of the tenet that students learn by doing, a belief about learning which Horton had stated explicitly.

† In answer to this question, Strauss found students scored highest on recognizing a problem and lowest on reasoning by analogy. Strauss's list of the elements and safeguards, in the order of decreasing scores, was: Recognizing a Problem, Observation, Testing the Hypothesis, Synthesis, Seeing Relationships, Fertility of Hypotheses, Drawing Conclusions from Data, Arranging Data, Selective Recall, Seeing Inadequacy of Data, Formulating and Testing Hypotheses, Prejudice, Essential Relationships, Analysis, and Reasoning by Analogy.

To the extent that we can assume that information in articles which appeared in *Science Education* at this time is representative both of the commitment of science educators to the philosophy of John Dewey and of the state of practice in science teaching in America's schools, we can conclude that the commitment was strong, but that there was little evidence that attempts to translate Dewey's philosophy into practice had produced any measurable effects in the thinking ability of students.

These same two trends are evident in the *Science Education* volumes that followed Dewey's second statement at the beginning of Volume 18 about the use of the intellect in the manner of the scientist. Although 17 years had passed during which little progress was realized, science educators continued to pursue vigorously the goal of operationalizing Dewey's philosophy. The articles in volumes 18–60 of *Science Education* provide evidence of their endeavors. During these four decades, progress was made in analyzing into its components the complex process of scientific inquiry. Also, from among these components, elements were selected which are appropriate for instruction at various grade levels. To aid them in identifying appropriate methods for teaching these elements, some science educators have sought guidance from several theories on the psychology of learning. Psychological theories of personality have also been brought to bear on the question of identifying factors that motivate certain individuals to seek out problems and to solve them. But, despite science educators' sophisticated research directed toward translating Dewey's philosophy into practice, there is little evidence in the literature that the desired outcome has been achieved even to a minimal degree.

In the article, "The Supreme Intellectual Obligation[5]," John Dewey takes note of the pervasive influence of science and its technological applications in most aspects of life, and the consequences of this fact. He asserts that this situation requires the further application of knowledge and intelligence. This is the "supreme obligation of intellectual activity." Dewey continues:

> The field of education . . . has hardly been touched by the application of science. . . . the scientific attitude, the will to use scientific method, and the equipment necessary to put the will into effect, is still, speaking for the mass of people, inchoate and unformed[5, pp. 2–3].

The concern of education should be with creating "a certain mental attitude," rather than "purveying a fixed body of information, or . . . preparing a small number of persons for the further specialized pursuit of some particular science[5, p. 3]."

> The responsibility of science cannot be fulfilled by educational methods that are chiefly concerned with the self-perpetuation of specialized science to the neglect of influencing the much larger number to adopt into the very makeup of their minds those attitudes of open-mindedness, intellectual integrity, observation, and interest in testing their opinions and beliefs that are characteristic attitudes of scientists. . . . Every course in every subject should have as its chief end the cultivation of these attitudes of mind[5, p. 3].

Dewey is especially critical of elementary education, which he views as

> the virgin field practically untouched by the influence of science. . . . So little attention is given to instilling, as a part of organic habit, trust in intelligence and eager interest in its manifestation. . . . little is done to secure full operation of what native intellectual capacity there is. . . . it is now everywhere subordinated to the acquisition of special

> skills and the retention of more or less irrelevant masses of facts and principles . . . [5, p. 3].

The ideas presented in this opening article of Volume 18 of *Science Education* are reflected again and again in the content and themes of articles in the volumes of the journal that followed thereafter. Scientific attitude, scientific method, scientific problem solving both as method of instruction and as an outcome of instruction, and the subordination of factual knowledge to the method of the intellect—all these themes are evident in volumes 18–60 of *Science Education.*

Dewey's article in Volume 18 is similar in certain ways to his earlier article in Volume 1, and it seems to have exerted a similar kind of influence on science educators. On the surface at least, Dewey's admonition was quite clear and readily accepted by science educators, but the complexities of the outcomes he was suggesting for education were so great that efforts to translate them into practice continued to be frustrated. For example, eight attempts are reported in the journal to define the elements of scientific attitude.* These studies were predicated on arguments similar to the one expressed in Volume 19 by Ira Davis[17]. Education is recognized as growth through problem solving. The question is then posed, "What method will be used to develop this philosophy?" Davis says that "the purpose of science teaching is to develop the ability in an individual to solve the problems that confront him," and that to do this, the individual will need: "(1) scientific attitude, (2) scientific method of procedure, and (3) a fund of information[17, p. 117]." But before instruction can be designed to meet any one of these three needs, the elements of each need must be defined. Thus, Davis and other science educators sensed the necessity for compiling a list of the characteristics of scientific attitude.

A most scholarly procedure for generating a valid list of the elements of scientific attitude was devised by Robert Ebel[18]. As did many other investigators, Ebel composed his preliminary list by consulting the writings of the world's most respected scientist-philosophers. The preliminary list in Ebel's case was refined using explicit criteria.† Of what use were these lists? They were responsible for the generation of considerable scholarly discourse, and some scales and tests were developed from them. And we might hazard the guess that they were used to communicate to teachers those behaviors they should be observing in their students.

A literature on scientific method, parallel to the scientific attitude literature, also exists in *Science Education.* The scientific method studies describe how lists of the elements

* These attempts to define the elements of scientific attitude usually were made in connection with developing a scale to assess one or several elements. See the eight studies reported by Davis[17], Ebel[18], Lampkin[19], Edwards and Robertson[20], Howard and Robertson[21], Boeck[22], Baumel and Berger[23], Billeh and Zakhariades[24], and Kozlow and Nay[25]. In addition to these attempts to define the elements of scientific attitude and to assess them, the meaning of scientific attitude and its implications were often discussed (for example, see Hurd[26], Punke[27], and Boeck[22]), and several reported studies sought to determine the effect of various instructional approaches on scientific attitude (for example, see Reiner[28], Eberhard and Hunter[29], Scott[30], Wessel[31], Harvey[32], Kahn[33], and Charen[34]). It is important to distinguish scientific attitude and its elements from attitudes toward science, scientists, or science learning, a distinction that was made clear by Aiken and Aiken[35] and by Klopfer[36]. The latter category of attitudes involves an entirely different literature, which is represented in *Science Education* by Weinstock[37], Vitrogen[38,39], Schwirian[40], and other articles.

† Ebel recognized the need for being explicit regarding criteria for refinement of the lists. He became aware of the need for an explicit methodology for the compiling of lists when he noted discrepancies among lists of elements of scientific attitude compiled by other investigators.

of scientific method were generated and used to develop tests.* There is some evidence that the tests were used to assess the extent to which classroom instruction engenders these elements in the behavior repertoire of students.† Some articles focus on scientific thinking.‡ Noteworthy among these articles are two by Mary Burmester[59,60] that describe the process she used to generate a list of behaviors involved in scientific thinking. From this list she constructed a "Test to Measure Some of the Inductive Aspects of Scientific Thinking," which is concerned with processes that parallel those noted in both the scientific attitude and method literature.§ It is not surprising, therefore, that an issue debated in several of the attitude and method articles concerns the distinction, if any, between scientific attitude and scientific method. The issue is not resolved, some authors (for example, Keeslar[62]) asserting that attitude and method are distinct entities and others (for example, Ebel[18]) supporting the point of view that the two are essentially opposite sides of the same coin.

A large number of articles focus on the theme of problem solving.¶ For purposes of analysis it is helpful to consider these articles as falling into one of three categories: articles that focus on problem solving ability as a valued outcome of instruction,‖ those that focus on problem solving as a method of instruction,** and those that focus on problem solving behavior as a psychological or social phenomenon.†† The direct influence of John Dewey is most obvious, of course, in the literature on problem solving as outcome and as method.‡‡ The ubiquitous problem of translating philosophy into practice is evident also in this literature. As was true for the notions of scientific attitude and scientific method, con-

* Notable among these tests is the instrument designed by John G. Read, which was a nonverbal test of the ability to use scientific method[41]. Other tests and lists of elements of scientific method were reported by Frutchey[42], Haupt[43], and Keeslar[44].

† See, for example, the studies by Teichman[45], Reiner[46], and Atkin[47].

‡ In addition to the two discussed in the text, the scientific thinking articles include contributions by Cahoon[48], Dunning[49–51], Mason[32], Perlman[53], Monaghan[54], Kastrinos[55], George[56,57], and Charen[58].

§ Interestingly enough, Kaplin[61] used Burmester's "Test on Some Aspects of Scientific Thinking" as a means of providing instruction on elements of scientific method.

¶ For most of the articles on this theme, the article's title clearly indicates that the article is concerned with an aspect of problem solving. However, in the last 15 years or so, terms such as inquiry, discovery, process, or task frequently appear in the titles of articles whose focus is on some aspect of problem solving. These variations in terminology are due, in part, to science educators' changing perspectives on problem solving, but also to considerable sloppiness in the use of terms by authors. In grouping together the articles in *Science Education* that focus on the theme of problem solving, we have been guided, not by an article's title, but by its content. Two nicely written discussions that reflect science educators' changing perspectives in the mid-1960s can be found in articles by Lahti[63] and Fischler[64]. Similarly, the discussions by Esler[65] and Wilson[66] reflect the perspectives of the mid-1970s.

‖ Articles that focus on problem solving as outcome include those by Lampkin[67–69], Jacobson[70], Meder[71], Hurd[121], Oburn and Montgomery [72], Novak[73], Butts[74], Aylesworth[75], Mahan[76], Bills[77], Mccormack[78], and Dietz and George[79]

** In addition to the articles cited in the text, those that focus on problem solving as method include contributions by Bingham[80,81], Henshaw[82], Michals[83], Aylesworth[84], Dean[85], Lanquis and Stull[86], Mark and Salstrom[87], Saadeh[88], Johnson et al.[89], and Anderson et al.[90].

†† Articles in this category began to appear in *Science Education* in the 1950s and are represented by studies discussed by Solomon[91], Carpenter[92], and Weiss[93]. For more recent articles which focus on problem solving behavior as a psychological phenomenon, see the citations in footnotes on p. 445.

‡‡ Because of Dewey's means–end philosophy, explicit statements of any distinction between problem solving as method and as outcome are practically nonexistent in the *Science Education* literature.

siderable effort apparently was exerted by science educators in seeking to define the "problem solving objective." The most comprehensive listing of the components of this objective was published in Volume 40 in an article by Ellsworth Oburn[94]. However, the work of defining the component cognitive, perceptual, and manipulative skills involved in problem solving is continuing up to the present day in research reported in the most recent volumes of *Science Education.*

The lack of practical information on how to engender problem solving behavior in students as a result of classroom practice was recognized in the 1949 report of the NARST Committee on Research in Secondary School Science[95]. The committee did not question the desirability of the objective to develop problem solving abilities, nor did they do more than to recognize the need to translate the philosophy into classroom practice. There is no recognition given in this report to articles, like those by Wood[96], Silberg[97], and Oburn and Montgomery[72], describing the techniques by which individual practitioners had attempted to develop problem solving abilities in students in their own classrooms. These "This-is-how-I-did-it" articles do not seem to be a very effective means of exerting even a moderate influence on others in the field.

The influence of the scientific study of education movement is evident in the problem-solving-as-method literature. Beginning with the 1938 report by Burnett[98], several experimental studies are reported that compare the effectiveness of *the* problem solving method with other methods of instruction.* Indicative also of the more scientific approach to the study of education is the trend—notable in the latest volumes of *Science Education*—for science educators to study problem solving within the framework of social and psychological theory. There are just a few articles that relate social and personality variables to problem solving.† These articles are reflections of more extensive work in other disciplines investigating problem solving in the context of business and technology and the application of psychoanalytical theory to the understanding of problem solving behavior. However, a more pronounced trend in the last decade or so has been the application of certain psychological theories.

Articles in volumes 56–60 of *Science Education* illustrate the trend toward the application of psychological theories of development and learning to problem solving in science education. This trend has resulted in better definition of the component skills of problem solving. The component skills are defined in the cognitive developmental terminology of Jean Piaget as mental operations overtly manifested in the ability to conserve or to exclude irrelevant variables. In the learning theoretical terms of instructional psychologists, these component skills are called process skills (e.g., observation, description, measurement). Articles describing empirical studies conceived in the context of both the cognitive developmental‡ and the learning theoretical§ frameworks have contributed to a better definition of the component skills of scientific problem solving. The better definition of problem solving skills makes it possible to design specific in-

* Representative of these Method A vs. Method B type of studies are the papers by Barnard[99], Dawson[100], Neal[101], Das[102], Nasca[103], and Mahan[104].

† This group includes articles by Chess[105], Washton[106], Blosser[107], Thorsland and Novak[108], and Mayfield[109].

‡ Studies conducted within the Piagetian framework were reported by Lengel and Buell[110], Raven[111], Lawson et al.[112], Lawson and Renner[113], Raven and Polan...[114], and Lawson[115].

§ This framework is the background for articles by Newport[116], Tomera[117,118], Bredderman[119], and Quinn and George[120].

structional activities and materials that foster these skills. In this sense, science education research studies guided by psychological theories contribute to improving and refining the use of problem solving as an instructional method. At the same time, the better definition of problem solving skills makes it possible to devise more precise and more focused procedures for assessing problem solving behavior as an outcome of science instruction. It is evident, then, that nearly 60 years after John Dewey's first article in Volume 1 of *Science Education,* science educators continue to hold in high esteem the method and outcome which Dewey advocated.

Some Perspectives

We have attempted to encapsulate the rich literature of *Science Education* devoted to reflective thinking and innovative problem solving in the perspective of certain aspects of the philosophy of John Dewey. Despite the commitment of science educators to the philosophy of John Dewey and the extensive efforts they have expended to make it a practical reality, the fact remains that little of the philosophy is evident in practice. Analysis of this situation in the context of the literature of *Science Education* suggests that, even though considerable attention was given to several different issues related to reflective thinking and problem solving, two issues were never explicitly addressed.

One issue is the extent to which it is reasonable to expect that the outcomes which Dewey suggests can be realized. With respect to this issue, it is important to consider that the kind of intellectual behavior Dewey values is not common. The science educators who attempted to add definition to the method of intelligence turned to the writings of a handful of the world's greatest scientist-philosophers. Although these lists were modified before being passed on to classroom teachers, one might expect that most teachers would be discouraged by the mere act of reading such an imposing list. How, a teacher might ask, can I be expected to teach children to engage in this kind of intellectual behavior when I don't possess many of the necessary requisites myself? How many of the science educators who were active in promulgating these objectives ever inventoried their own intellectual behavior?

The second issue concerns values. The outcomes Dewey proposes have clear personal value for Dewey and, on the basis of the literature in *Science Education,* they also have personal value for the majority of the science educators who contributed to the journal over the years. But, to what extent are they valued by the greater society, the school, and teachers? Translating philosophy and theory into practice requires more than just making method and objectives explicit. The appropriateness of the objectives for the intended learners and the extent to which the society and the school value the outcomes are issues of comparable importance.

Appendix I: Sample Items from Weller's Test

Attitude Items (True-False):

1. Finding a four leaf clover brings good luck.
2. A person dies because a star falls.
3. To go to sleep while looking at the moon causes nightmares.
4. Muskrats build houses higher than usual if the winter is to be a severe one.

Skills Items:

1. You can find out whether the sun is in different parts of the sky at different times of the day by
   a. reading about it.
   b. asking your teacher.
   c. asking your father or mother.
   d. looking to see for yourself.
2. If you notice that the sun is in a different part of the sky at different times of the day it is because
   a. either the sun or earth moves, or both move.
   b. somebody moves it.
   c. it is drawn across the sky by the sun god.
   d. it is so far away.
3. You could prove whether your answer in number 2 is right by
   a. talking it over with another boy or girl.
   b. asking a man who studies about the sun and stars.
   c. doing an experiment.
   d. deciding for yourself.

1. If it is a clear day on February 2 and the ground hog sees its shadow
   a. there will be bad weather for 40 days after that time.
   b. we may or may not have bad weather.
   c. it is a sure sign of rain.
   d. we will have good weather for 40 days after that time.
2. If it does rain for 40 days after the ground hog has seen its shadow
   a. it is a sure sign that it must always do it every year.
   b. it may just have happened that year.
   c. it is a good weather forecast.
   d. it will certainly happen again next year.
3. You can best prove your answer to number 2 by
   a. asking the keeper of the zoo.
   b. noting for several years whether or not we have had bad weather after the ground hog saw his shadow.
   c. asking your father or mother.
   d. looking it up in a science book[12, pp. 93–94].

Appendix II: Elements and Some Safeguards used by Downing

Elements of Scientific Thinking	Safeguards
Purposeful observation	a. must be accurate; b. must be extensive; c. must be done under a variety of conditions.
Analysis—Synthesis	d. The essential elements in a problematic situation must be picked out. e. Dissimilarities as well as similarities must be regarded. Danger of analogy. f. Exceptions are to be given special attention. Selective interpretation.
Selective recall	g. A wide range of experience is necessary.
Hypotheses	h. All possible ones must be considered. (Fertility of suggestion.)
Verification by inference and experiment	i. Inferences must be tested experimentally. j. Only one variable is permitted.

Reasoning by:
1. method of agreement
2. method of difference
3. method of residues
4. method of concomitant variation
5. joint method of agreement and difference

Judgment

k. Data must be cogently arranged.
l. Judgment must be passed on the adequacy of the data.
m. Judgment must be passed on the pertinency of data.

n. must be unprejudiced;
o. must be impersonal;
p. must be suspended if data are inadequate [16, pp. 231–232]

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I. AIMS AND OBJECTIVES OF SCIENCE TEACHING

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Discussions of general aims of instruction in science; Statements or discussions of purposes and objectives of science programs or courses; Proposals of methods for achieving particular objectives.

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Ahrens, H. J. Edward
SEE Hunter, George W.

Axtelle, George E. Why Teach Science? 34:162-164

Aylesworth, Thomas G. The Need for Problem-Solving 49:156-162

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XV. ABSTRACTS

includes:

Short accounts of articles published in the contemporary periodical literature; Descriptions of the contents of contemporary non-book publications relevant to science education.

This section of the index gives references to abstracts in *Science Education* of articles which appeared in other periodicals. In each index entry, the reference to the abstract in *Science Education* is given at the end and is preceded by an asterisk (*). For example, the format of a typical index entry is

Bayles, Ernest E. Major problems in the Teaching of Natural Science. Sch Sci 31: 1048-1055; D '31. *16: 248

The reference at the end of this entry locates the abstract of Bayles' article in *Science Education*, volume 16, page 248. The index entry also shows that the full article appeared in *School Science and Mathematics*, volume 31, pages 1048-1055, and was published in December 1931. To save space, we have used abbreviations in giving the titles of the periodicals in which the articles appeared. A guide to these abbreviations follows.

Admin = Administration
Am = American
Assoc = Association
Bul = Bulletin
Chem = Chemistry
Col = College, Colleges
Ed = Education, Educational
Gen = General
J = Journal
Nat = National
Pop = Popular
Pub = Publications
Quart = Quarterly
R = Record
Rep = Report
Res = Research
Rev = Review
Sch = School, Schools
Sci = Science
U = University
Univ = University

Am J Ph = American Journal of Physics
Cor RSL = Cornell Rural School Leaflet
J Ch Ed = Journal of Chemical Education
J Ed Psych = Journal of Educational Psychology
Nat Geo = National Geographic Magazine
Sch Sci = School Science and Mathematics
Sci Am = Scientific American
Sci G = Science Guide for Elementary Schools
Sci L = The Science Leaflet
Sci Mo = The Scientific Monthly
T Biol = The Teaching Biologist
T Col R = Teachers College Record

The abbreviations used for months
Ja = January
F = February
Mr = March
Ap = April
My = May
Je = June
Jl = July
Ag = August
S = September
O = October
N = November
D = December

To prepare this section of the index, copies of all the abstracts that appeared in volumes 14 through 33 of *Science Education* were pasted on cards, and these cards were sorted into 14 main categories, corresponding to the 14 sections in the first two divisions of the index. These same categories constitute the 14 major subsections (A through N) of the present section. However, it was not possible to list references to all 2900 abstracts in this section due to space limitations.

We sought to include in the index references to abstracts of the more significant articles. Our principal criteria for inclusion were the apparent importance of the contribution to science education that the article made, the length of the article (with the longer pieces more likely to be included), and the extent of contemporary interest associated with the article's theme or its author. For articles meeting these criteria, the references to their abstracts in *Science Education* will be found under the opposite subsections below.

(Any scholar who may have a need for references to the abstracts which we have omitted in any subsection should communicate with us. We would be glad to make copies available at cost of the cards containing the the omitted abstracts. Anyone requesting such copies should note that, while some abstracts were omitted in every category, there are several hundred omissions in each of these subsections: C, D, L1, L2, N.)

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Blough, Glenn O. Elementary Science Objectives. Sch Life 29:28-29; O '46. *31:103

Brandwein, Paul F. The Modern Role of Biology Teaching. T Col R 45:265-271; Ja '44. *28:179

Burnett, R. Will The Science Teacher and His Objectives. T Col R 45:241-251; Ja '44. *28:179

Carlson, A. J. The Contribution of the Biological Sciences. Bul Assoc Am Col 23:72-82; Mr '37. *21:164

Clark, Harold F. The Learning of Subject Matter. T Col R 41:102-115; N '39. *24:116

Cunningham, Harry A. Objectives in High School Biology. Sch Sci 35:462-467; 606-612; My, Je '35. *19:135

Curtis, Francis C. Report of the Sub-Committee on General Science. North Central Assoc Quart 5:410-437; D '30. *15:122-123

Curtis, Otis F. Education by Authority or for Authority? Are Science Teachers Teaching Science? Sci 90:93-101; Ag '39. *24:116

Downing, Elliot R. A New Interpretation of the Functions of High-School Science. J Higher Ed 4:365-367; O '33. 18:48

Gruenberg, Benjamin C. School Science and Public Needs. Nation's Schools 20:1-3; S '37. *22:153

Gruenberg, Benjamin C. Vital Values in Science Teaching. Sch Sci 31:125-137; F '31. *16:76

Holmes, Harry N. The Contribution of the Physical Sciences. Bul Assoc Am Col 23:67-72; Mr '37. *21:164

Mann, Paul B. Why Teach Science? Sci Counselor 5:11-12, 22; Mr '39. *23:222

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Muthersbaugh, G. C. Objectives of a Proposed Course of Study in Physics for Senior High Schools. Sch Sci 29:943-954; D '29. *14:651

Pilley, John G. Scientific Method. T Col R 40:317-328; Ja '39. *23:347

Powers, S. R. Educational Values of Science Teaching T Col R 32:17-33; O '30. *15:61-62

Powers, S. Ralph Science in Education. New York State Ed 20:520-523; 573-579; Ap '33. *17:241

Powers, Samuel Ralph The Science Teacher and the Changing Functions of Secondary Education. T Col R 45:234-240; Ja '44. *28:178

Smith, Otto M. Accepted Objectives in the Teaching of General College Chemistry. J Ch Ed 12:180-183; Ap '35. *20:44

Wallace, R. C. The Changing Values of Science. Sci 88:265-271; S '38. *23:221

B. Science Curriculum

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Baker, Ross A. Some Trends in Chemical Education. Rep New England Assoc Chem Teachers 38:6-19; S '36. *21:48

Barnett, John A. Teaching General Science. High Sch Teacher 10:293-320; D '34. *19:83

Becker, Carl H. Secondary Education and Teacher Training in Germany. T Col R 33:262-278; 347-363; D '31, Ja '32. *16:324

Berry, Pauline G. The First Year Chemistry Course. J Ch Ed 8:1781-1815; S '31. *16:166

Blondell, Carleton A Selected and Annotated Bibliography of Secondary Biology. Sch Sci 33:309-319; Mr '33. *17:339

Bray, Willis J. A Study of Achievement of Students of General Chemistry in College. Sch Sci 32:19-29; Ja '32. *16:329

Briggs, Thomas H. General Science in the Junior High School. T Col R 33:599-609; Ap '32. *16:424

Brown, H. Emmett Science in the New Secondary School. T Col R 35:694-707; My '34. *18:180

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Craig, Gerald S. An Elementary Teacher Looks at Secondary Science. Progressive Ed 10:417-421; N '33. *18:51

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Curtis, Francis D. The Emergence of Elementary Science. Sch of Ed Bul (U of Mich) 4:86-88; Mr '33. *17:243

Daffin, John B. Why the Woman Student Does Not Elect Physics. Am Physics Teacher 5:82-85; Ap '37. *25:255

Dale, Edgar Children's Questions as a Source of Curriculum Material. Ed Res Bul 16:57-66; Mr '37. *21:254

Dunning, J. R., and Farwell, H. W. The Two Year Science Program in Columbia College. Am Physics Teacher 5:150-156; Ag '37. *22:38

Durflinger, G. W. Shall Modern Physics Be Included in the High School Course? Sch Sci 32:328; Mr '32. *16:427

Embree, Royal B., and Floyd, Oliver R. The Predictive Value of General Science. J Ed Res 31:650-655; My '38. *22:269

Fitzpatrick, Frederick L. Biological Materials in the Program of General Education. T Col R 49:398-405; Mr '48. *32:368

Fraser, Thomas P. Science Survey Courses in Accredited Negro Colleges. J Negro Ed 9:13-21; Ja '40. *24:401

Freeman, Frank N. A Plea for General Scientific Training in Educational Institutions. Harvard Teachers R 2:108-116; Je '32. *16:506

French, Sidney J. Science in General Education. J Gen Ed 1:200-205; Ap '47. *32:124

Fyfe, W. H. Science in Secondary Education. Sch Sci Rev 16:289-297; Mr '35. *19:135

Gamble, Joseph N. The Place of Natural Science in Programs of High School Graduates. Sch Rev 39:177-185; Mr '31. *16:78-79

Gillespie, Alex S. Biology in the Education of New Germany. Sch Sci Rev 17:398-410; Mr '36. *21:44

Glasoe, P. M. The Present High School Course in Chemistry--A Paradox. J Ch Ed 15:364-367; Ag '38. *22:370

Gluck, Harold What Students Want to Learn in Consumer's Education. Teaching Biologist 8:1-6; O '38. *22:370

Hall, Carrol C. Concomitant Problems that Arise with the Presentation of the Subject Matter in Secondary Chemistry. J Ch Ed 17:240-249; My '40. *24:401

Haupt, G. W. Grade Placement in Elementary School Science. Sch Sci 35:858-864; N '35. *20:43

Hurd, A. W. Reorganization in Physics. North Central Assoc Quart 4:227-293; S '29. *14:651

Kiebler, E. W., and Curtis, Francis D. A Study of the Contents of the Laboratory Course in High School Physics. Sch Sci 29:980-985; D '29. *14:651

Kinsey, A. C. The Contents of the Biology Course. Sch Sci 30:374-384; '30. *14:649

Lancelot, W. H. The Course in High School Chemistry. North Central Assoc Quart 5:494-507; Mr '31. *16:167

Laton, Anita D. Approaches to Sex Education in the Schools. Univ High Sch J 16:147-155; Ap '38. *22:369

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Lynch, Mary E. High School Biology as a Contributing Factor in Health Education. Sch Sci 31:931-951; N '31. *16:248

McCue, J. J. G. Ancient Science in the Modern Curriculum. Am J Ph 16:404-408; O '48. *33:72

Morrison, J. Cayce A Generalist Looks at Science in the Elementary Schools. T Col R 37:282-289; Ja '36. *20:178

New York State Department of Education Elementary School Science--A Tentative Syllabus for Elementary Schools, Grades 1-6. State Dept of Ed 109 p.; '31. *16:423

Neureiter, P. R. A Comparison of Science Curricula in European and American Schools. J Ch Ed 8:2040-2045; O '31. *16:164

Noll, Victor H. The Extent of Chemical Education. J Ch Ed 12:475-481; O '35. *20:41

Powers, Samuel Ralph Improvement of Science Teaching. T Col R 40:273-283; J '39. *23:347

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Preston, Charles E. Science and the Changing Curriculum. High Sch J 31:158-165; 181-182; My '38. *23:221

Preston, C. E. Teaching High-School Science in War-Time. High Sch J 25:298-302; N, D '42. *27:151

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Satterly, John Observations on the Objectives and the Teaching of Physics in England and Canada. Am Physics Teacher 7:1-9; F '39. *23:222-223

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Conant, James Bryant Public Education and the Structure of American Society. T Col R 47:145-195; D '45. *30:183

Davis, Mary Houston and Rose, Elizabeth Lamar Making Theories Work. High Sch J 25:251-260; O '42. *27:77

Dewey, John Can Education Share in Social Reconstruction? Social Frontier 1:11-12; O '34. *19:81

Douglass, Harl R. The Effects of State and National Testing on the Secondary School. Sch Rev 42:497-509; S '34. *18:244

Glicksberg, Charles I. Definitions in Education. High Sch J 25:18-25; Ja '42. *26:161
Hutchins, Robert M. Ethics, Politics and Education. Sch and Society 54:257-261; O '41. *26:158
Jessen, Carl A. Secondary Education. Bulletin No. 22, U.S. Office of Education; '29. *14:656
Kilpatrick, William H. The Philosophy of the New Education. Sch and Society 54:481-484; N '41. *26:158
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Russell, Bertrand Education for Democracy. J Nat Ed Assoc 28:97-98; Ap '39. *23:349
Symposium: Adventures in the Reconstruction of Education. Ed Res Bul 19: 335-362; S '40. *25:54
Symposium: American Education Viewed by European Eyes. Harvard Teachers Rec 3:7-46; F '33. *17:153
Symposium: Conference on Philosophy of Education. T Col R 49:263-290; Ja '48. *32:214
Symposium: Education for the Gifted. T Col R 42:375-460; F '41. *25:401
Symposium: Progressive Practices in Secondary Schools. High Sch J 22: 257-297; N '39. *24:174
Symposium: A Progress Report of the Horace Mann-Lincoln Institute of School Experimentation. T Col R 49:305-362; F '48. *32:214
Symposium: Techniques of Gathering Data on Characteristics of High School Students. Univ High Sch J 17:181-233; Je '39. *24:117
Symposium: Trends in Education. Phi Delta Kappan 21:369-397; Ap '39. *23:348
Symposium: Values and Shortcomings of Subject-fusion Projects. Calif J Secondary Ed 10:269-302; Ap '35. *19: 183
Tyler, Ralph W. Defining and Measuring Objectives of Progressive Education. Ed Res Bul 15:67-72; Mr '36. *20:175
Watson, Goodwin and Flaser, Edward M. Education for Critical Thinking. Advanced Sch Digest 6:29-33; D '40. *25:346
Yanch, Wilbur A. A Defense of Progressive Education, and Pratt, Karl C. Funeral Oration for the Late Progressive Educator. Sch and Society 60:65-77; Jl '44. *29:55
Zinsser, Hans None of My Business: Or Thoughts of a Biologist on Education. Sch and Society 38:685-693; N '33. *18:48

XVI. BOOK REVIEWS

includes:

Short reviews of recently published books relevant to science education.

The index entries for this Book Reviews section have been categorized similarly to those in the Abstracts section. The 15 main subsections into which the entries are categorized parallel to the 14 sections of this index's first two divisions and includes a Miscellaneous category for reviews of books dealing with topics not falling into any category used in the index. However, the more than 6700 book reviews which appeared in *Science Education* are far from evenly divided among the 15 main subsections, so we broke down the large subsections into appropriate subdivisions. An overview of all the subdivisions we have used can be found in the descriptive Table of Contents at the front of the index.

After preparing cards for all book reviews, we found that there were many more entries than could be accommodated in the available space for this section of the index. Consequently, we made a selection of entries of reviews to include in the index, using as our primary criterion the relevance of the book reviewed to science teaching or to a research or special interest area of science education. One result of applying this criterion is that we have included entries in the index for all science textbooks which were reviewed in the 60 volumes of *Science Education*.

In selecting entries for the index, we chose to exclude entries of reviews from subsection L, Scientific Information, if the review indicated that the book's perspective of its subject matter was not scientifically sound. For example, we deleted entries for reviews of books that describe the behavior of animals in anthropomorphic terms. We also excluded from this subsection most entries of reviews of books which dealt with technical or technological topics. For instance, few reviews are included for books on photography or radio. Many book reviews which we categorized under subsection N, Education in General, and subsection O, Miscellaneous, were not entered in the index; the entries remaining in each of these subsections simply represent the various topics of the several hundred books whose reviews we categorized there.

(Any scholar who may have a need for references to the book reviews whose entries we excluded from subsection, L, N, or O should communicate with us. We would be glad to make copies available at cost of the cards containing references to the omitted book review entries.)

A. Aims and Objectives of Science Teaching

Blough, Glenn O. and Blackwood, Paul E. Science Teaching in Rural and Small Town Schools. '49 33:301-2

Cohen, I. Bernard and Watson, Fletcher G. General Education in Science. '52 36:307

Craig, Gerald S. Science in Childhood Education. '44 29:54

Gardner, P. L. (Editor) The Structure of Science Education. '75 60:427-28

Symposium: The Place of Science in the Education of the Consumer. '45 30: 173

B. Science Curriculum

Baker, Emily V. Children's Questions and Their Implications for Planning Curriculum. '45 32:64

Bailey, Edna W. Science in Junior High School. '21 6:418

Beauchamp, Wilbur L. Instruction in Science. '32 19:194

Brandwein, Paul F. The Gifted Student as Future Scientist. '55 40:79

Brown, H. Emmett The Development of a Course in the Physical Sciences for the Senior High School of the Lincoln School of Teachers College. '39 24: 295

Brown, Kenneth E. and Johnson, Philip G. Education for the Talented in Mathematics and Science. '53 37:349

Brunson, Mrs. DeWitt and Dowling, Thomas I. (Editors) Suggestions for the Teaching of Science in the Twelve-Year School Program. 33:82

Burnett, R. Will Combatting Prejudice Through Science Teaching. '52 36:256

Caldwell, Otis W. Science Teaching in the Gary Public Schools. 4:299

Cobb, Walter F. Chalk Talks on Health and Safety. 10:432

Craig, Gerald S. Elementary Science. 12: 496

Craig, Gerald S. A New Science Program for Elementary Schools. '34 18:252

Curtis, Francis D. A Synthesis and Evaluation of Subject Matter Topics in General Science. '29 13:184

Department of Public Instruction, Commonwealth of Pennsylvania Courses of Study in Science. '32 18:56

Dressel, Paul L. and Mayhew, Lewis B. Science Reasoning and Understanding. '54 39:170

Fitzpatrick, Frederick L. Biology for Public School Administrators. '34 20:467

Geer, Edith S., Waite, Evangeline and Rotter, George E. Science for Nebraska Elementary School Children. '50 36: 195-6

Gillson, Margery Stewart Developing a High School Chemistry Course Adapted to the Differentiated Needs of Boys and Girls. '37 22:45

Heiss, Elwood D. An Investigation of Content and Mastery of High School General Science Courses. '32 16:429-30

Heller, R. (Editor) New Trends in Biology Teaching. '71 56:572

Hoyman, Howard S. Health Guide Units for Oregon Teachers. '46 32:61

Humby, S. R. and James, E. J. F. Science and Education. '42 27:50

Hurd, Archer Willis Building a Curriculum for Professional Schools with Special Reference to Nursing. '46 31:182

Hurd, Archer W. Costs and Other Problems in Schools of Nursing. '51 36:307

Hurd, Archer Willis What the Testing Program in the Schools of Nursing Has Taught Us. '46 31:182

Hurd, Paul D. (Editor) New Curriculum Perspectives for Junior High School Science. '70 57:100-1

Hurd, Paul DeHart New Directions in Teaching Secondary School Science. '69 54:391

Jacobson, Willard J. The New Elementary School Science. '70 56:275

Johnson, Philip G. The Teaching of Science in Public High Schools. '50 35: 54

Joseph, E. D. The Teaching of Science in Tropical Primary Schools. '53 39:167

Karplus, Robert Theoretical Background of the Science Curriculum Improvement Study. '66 51:413

Karplus, Robert and Thier, Herbert D. A New Look at Elementary School Science. '67 52:91

Kern, O. J. Outline of Course of Instruction in Agricultural Nature Study for the Rural School of California. 4:299

Kilander, H. F. Health Instruction in the Secondary Schools. '52 38:181

Kilander, Holger Frederick Science Education in the Secondary Schools of Sweden. '31 16:257

Lackey, Earl E. Introductory Geography for Teachers College Students. '33 20:112

Lampkin, Richard H. Variability in Recognizing Scientific Inquiry. '49 34:322-3

Leovenguth, J. C. General Science Syllabus. 8:451

Lewis, June E. and Potter, Irene C. The Teaching of Science in the Elementary School. '70 56:279

Lockard, J. David (Compilator) Report of the International Clearinghouse on Science and Mathematics Curricular Developments. '67 51:402

Martin, Michael Concepts in Science Education. '72 57:552

Martin, W. Edgar The Teaching of General Biology in the Public High Schools of the United States. '52 37:349

Maryland State Department of Education The Teaching of General Science in High School; The Teaching of High School Chemistry; The Teaching of High School Physics; The Teaching of High School Biology. 6:343

Maxwell, Paul A. Cultural Natural Science for the Junior High School. '32 17:159

Meier, Lois Natural Science Education in the German Elementary Schools. '30 15:72

Members of the Faculty of the Laboratory Schools of the University of Chicago Science Instruction in Elementary and High-School Grades. '39 25:168

Metzner, Jerome Science Experiences and St. James Park, Bronx, New York, as an Outdoor Laboratory for the Teaching of Science in Nearby Schools. '46 31: 183

Miles, Vaden W. Principles and Experiments for Courses of Integrated Physical Science. '50 35:134

National Science Foundation Course and Curriculum Improvement Projects. '66 51:413

Nelson, George E. The Introductory Biological Sciences in the Liberal Arts College. '31 16:337

Nixon, Alfred F. Teaching Biology for Appreciation. '50 34:267

Noll, Victor H. (Chairman) The Forty-Sixth Yearbook of the National Society for the Study of Education, Part I. Science Education in American Schools. '47 31:329

Palmer, E. Laurence Nature Magazine's Guide to Science Teaching. '36 22: 101

Parker, Bertha M. An Introductory Course in Science in the Intermediate Grades. '31 16:521

Pella, Milton O. The Status of Science Offerings in Wisconsin Schools in 1955-56. '56 41:238

Persing, Ellis C. A Manual for General Science in the Ninth Grade. 6:343

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Pruitt, Clarence Martin An Analysis, Evaluation and Synthesis of Subject-Matter Concepts and Generalization in Chemistry. '35 20:47

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Rogers, Lola Eriksen Science Teaching in the Public Junior High School. '67 51:413

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Science Masters' Association The Teaching of General Science, Part I. '36 23:171-2

Shapp, Martha Glauber Planning and Organizing Science Programs in Elementary Schools. '58 44:155

Shelton, H. S. The Theory and Practice of General Science. '39 25:232

State Department of Education, Baltimore, Maryland Science in the Elementary School: Suggested Units, Grades 1-7. '33 18:256

State Department of Education, Sacramento, California Suggested Courses of Study in Science for Elementary Schools. '32 18:57

Stapp, William B. Integrating Conservation and Outdoor Education into the Curriculum (K-12). '65 49:96

Stevens, Bertha Child and the Universe. '31 16:336

Stover, Frank B., Winans, S. David and Wilkins, Wilton A. Science and Mathematics Teaching in New Jersey Public High Schools. '56 41:238-39

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Walters, Verna Science Education for the Elementary Schools of Ohio. '45 33: 307

Weber, Lynda M. Functional Health Teaching Syllabus. '41 26:163
Wetherington, Julia Science for the Elementary School. '41 33:308
Whitla, Dean K. and Pinck, Dan C. Essentially Elementary Science. '73 59: 434-36
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Course of Study in Elementary School Science Grades 4, 5, and 6. 36:196
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Sillibi on High School Subjects: Including General Science, Physiography, Botany, Horticulture and Zoology. 3:52
Stamford Curriculum Guide for Drug Abuse Education. '71 55:585
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C. Instructional Procedures
1. Methods and Procedures of Instruction

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Althouse, Rosemary and Cecil Main, Jr. Science Experiences for Young Children. 60:431
Anderson, O. Roger Teaching Modern Ideas of Biology. '73 57:556
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Arnold, Herbert J. The Selection, Organization, and Evaluation of Localities Available for Unspecialized Field Work in Earth Science in the New York City Region. '36 21:224
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Astell, Louis A. and Odell, Charles W. High School Science Clubs. '32 16: 526
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Balchin, W. G. U. and Richards, A. W. Practical and Experimental Geography. '52 38:317
Bauer, W. W. and Edgley, Leslie Your Health Dramatized. '39 23:227
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Beeler, Nelson F. and Branley, Franklyn M. Experiments in Optical Illusion. '51 36:199
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Bingham, N. Eldred Teaching Nutrition in Biology Classes. '39 23:351
Blackwood, Paul E., Ruchlis, Hyman and Brandwein, Paul Discoveries in Magnetism and Junior Scientist's Kit. '56 41:345
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Clemensen, Jessie Williams Study Outlines in Physics. '33 17:340

Coit, C. Marjorie (Editor) Projects in Science and Nature Study at the American Institute Children's Fair. '31 16:338
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Crow, Leonard R. Experimental Electricity for the Beginner. '53 39:169
Davis, Helen Miles Science Exhibits. '55 41:344
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Frewin, J. G. A New Experimental Science. 11:134
Garrison, Charlotte G. Science Experiences for Little Children. '39 24: 177
Greene, Kingsley L. and Ochs, Charles C. Outdoor Education: Secondary Science, Elementary Science. '66 51:407
Greenlee, Julian Better Teaching Through Elementary Science. '54 39:64-5
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Gross, Herbert H. Resource Materials Elementary Science. '54-'55 41:344
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Hawk, Burton L. The Chemistry We Use. '53 37:350
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Laton, Anita D. and Bailey, Edna W. Suggestions for Teaching Selected Material from the Field of Sex Responsiveness, Mating and Reproduction. '40 25:409
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Laton, Anita D. and Powers, S. Ralph New Directions in Science Teaching. '49 34:322
Leining, Edna Bridge Millions of Years in a Winter. '35 20:521
Lemon, Harvey B. and Marshall, Fitz-Hugh The Demonstration Laboratory of Physics at the University of Chicago. '39 24:295
Lockwood, Elizabeth A. Activities in Nutrition Education for Kindergarten Through Sixth Grade; Goals for Nutrition Education for Elementary and Secondary Education. 33:301
Long, Ernestine M. J. Project Kit. '39 24:357
Lutz, Frank E. Nature Trails: An Experiment in Outdoor Education. 11:60
Lynde, Carleton John Science Experiences with Inexpensive Equipment, Science Experiences with Home Equipment and Science Experiences with Ten-Cent Store Equipment. '51 36:256
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Miller, George J. (Editor) Geography How to Teach It. '34 20:112
Mills, Lester C. and Dean, Peter M. Problem-Solving Methods in Science Teaching. 50:400
Montgomery, Elizabeth Rider Keys to Nature's Secrets. '46 31:118

Moore, Clyde B. and Wilcox, Lillian A. The Teaching of Geography. '32 18: 194
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Nelson, Leslie W. and Lorbeer, George C. Science Activities for Elementary Children. '52 39:93
Partridge, J. A. Natural Science Through the Seasons. '47 33:307
Patterson, Margaret E. (Editor) Science Clubs of America Sponsor Handbook. '54 39:170
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Porter, Harold M. and Porter, Jermain D. Chemcraft Experiment Book: Directions fur Performing 814 Experiments. '37 22:334
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Simmons, Maitland P. The Young Scientist. '51 36:59-60
Slavson, S. R. and Speer, Robert K. Science in the New Education. '34 19:87
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Stepp, Ann Setting Up a Science Project. '66 51:401
Stevens, R. A. Out-of-School Science Activities for Young People. '69 56:570-71
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Triezenberg, Henry J. Individualized Science--Like It Is. '72 58:136
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van Kloster, Henry S. Lecture Demonstrations in Physical Chemistry. 7:143
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Weisbruch, Fred T. Lecture Demonstration Experiments for High School Chemistry. '51 37:350
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Woodring, Maxie Nave, Oakes, Mervin E. and Brown, H. Emmett Enriched Teaching of Science in the High School. '41 26: 216
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Baxter, Tompsie and Young, Bess M. Ships and Navigation. '33 18:191
Bee, Lowell R. Weather and the Weatherman. '53 38:118
Connor, William H., Cross, Burnett, Evans, Hubert and Tannenbaum, Harold Electric Power and Social Policy. '51 37:140
Crary, Ryland W., Evans, Hubert M., Gotlieb, Albert and Light, Israel The Challenge of Atomic Energy. '48 33: 316
Davis, Lillian B. Prevention of Communicable Diseases. '31 17:350
De Leon, Benjamin The Story of the Thermometer. '46 30:319
Edge, Rosalie Our Nation's Forests. '38 23:113
Evans, Everett Conservation of South Dakota's Natural Resources. '53 38: 413
Hand, Harold C. (Editor) Living in the Atomic Age. '46 32:44
Lumley, Ellsworth D. Eagles; Hawks. '35 20:109-110
Lumley, Ellsworth D. Owls. '37 22:326
Persing, Ellis C. (Editor) The Book of Knowledge Science Series. 11:134
Phillips, M. V. Physical Geography: Interpreting the Physical Features of the Earth. '66 14:397
Rose, Mary S. and Bosley, Bertlyn Our Cereals--A Nutrition Unit for the Fourth, Fifth, and Sixth Grades of the Elementary School. '38 23:57
Wittick, Eugene C. The Development of Power. '39 23:235
The Atom and You. '50 36:61
Compton's Pictured Teaching Unit-Materials. '35 21:171
The Earth and Its Neighbors; Pets; Birds; Suggestions for Science Observations and Experiences in the Elementary School; Spring Season; Suggestions for Science Observations and Experiences in the Elementary School: Autumn and Winter. 36:196
Eyesight Conservation. 9:208
Food and Nutrition. '55 40:244
Forests and the Natural Water Cycle. '57 41:345
Learning about Atomic Energy. '50 36:61
Poliomyelitis: A Source Book for High School Students; Poliomyelitis: A High School Teacher's Guide. '54 39:240
Practical Problems in Physical Science. '40 26:216
Safety in General Science. '48 33:310
Science Creates a Modern Industry. '47 32:292

D. Instructional Media, Science Equipment, and Facilities

1. Textbooks for the Elementary School Student

a. General Science (includes text series for elementary school grades K-8 and junior high school grades 7-9)

Barber, F. D. First Course in General Science. 1:240
Barber, Fuller, Prior and Adams Science for Beginners. 6:417
Barber, Fuller, Prior and Adams. Lessons in Science. '22 8:533
Barnard, J. Darrell, Stendler, Celia, Spock, Benjamin, Braidford, Margaret and Atkin, J. Myron The Macmillan Science--Life Series. '62 51:408
Beauchamp, Wilbur L., Mayfield, John C. and West, Joe Young Science Problems Series. '38-'39 22:337; 23:291

Beauchamp, Wilbur L., Mayfield, John C. and Hurd, Paul DeHart Teacher's Edition Science Problems 1; Teacher's Edition Science Problems 2; and Teacher's Edition Science Problems 3. '65 52:(3)IBC

Beauchamp, Wilbur L., Mayfield, John C. and Hurd, Paul DeHart Science Is Explaining 7 and 8. '63 52:(3)IBC

Beauchamp, Wilbur L., Mayfield, John C. and West, Joe Young Teachers Guidebook for Science Problems Book 1; Science Problems Book 2; Teachers Edition A Studybook for Science Problems Book 1. '52 37:336

Beauchamp, Wilbur L., Melrose, Mary and Blough, Glenn O. Discovering Our World Series, Books 1-3. '37-'39; '47 22:156; 24:175; 32:289; 32:290

Bedford, Edgar A. General Science. 6:417

Bowden, Garfield A. General Science. 7:298

Brandwein, Paul F., Cooper, Elizabeth K., Blackwood, Paul E. and Hone, Elizabeth B. Teacher's Edition Concepts in Science 1-6. '66 51:410

Brandwein, Paul F., Hollingsworth, Leland G., Beck, Alfred D. and Burgess, Anna E. Science for Better Living. '50 34:324-25

Brandwein, Paul F., Hollingsworth, Leland G., Beck, Alfred D. and Burgess, Anna E. Science for Better Living Series, Books 1-3. '53; '55 37:339; 40:70

Brownell, Herbert General Science and the Economics of Daily Life. 3:51

Bruce, Guy V. Children's Play-at-Science Series. '38; '43 23:54; 28:294

Caldwell, Otis and Curtis, Francis D. Everyday Science. '43 27:79

Caldwell, Otis W. and Eikenberry, W. L. Elements of General Science. 1:241

Caldwell, Otis W. and Eikenberry, W. L. Elements of General Science. 8:601

Caldwell and Eikenberry Elements of General Science with Experiments. 11:60

Caldwell and Eikenberry General Science. 3:51

Caldwell and Meier Open Doors to Science. 10:354

Carpenter, Harry A. and Wood, George C. Our Environment: Its Relation to Us. '28 12:565

Carpenter, Harry A. and Wood, George C. Our Environment: Its Relation to Us. '33 18:186

Carroll, Franklin B. Interpreting Science; Understanding Our Environment; Understanding Our World; Understanding the Universe. '39 23:395

Carroll, Franklin B. Interpreting Science Series: Understanding Our Environment; Understanding Our World; Understanding the Universe. '47 32:292-93

Carroll, Franklin B. Interpreting Science Series. '52 37:346

Clark, Bertha M. An Introduction to Science.

Clark, Bertha M. New Introduction to Science. '28 12:565

Clement, A. G., Collister, M. C. and Thurston, E. L. Our Surroundings. 12:494

Clement, Arthur C., Collister, Morton C. and Thurston, Ernest L. Our Surroundings. '31 18:189

Corwin, Mae Johnson and Corwin, Walling Junior High School Science. '31 18:54

Corwin, Walling and Corwin, Mae Johnson The Science of Plant and Animal Life. '31 16:253

Coulter, John G. Elementary Science. 3:52

Craig, Gerald S. et al. New Pathways in Science, Books 1-7. '40-'41 24:354; 26:216

Craig, Gerald S. et al. Our World of Science Series, Books 1-8. '46-'47 31:104; 31:105; 31:182; 32:288

Craig, Gerald S. et al. Science Today and Tomorrow Series, Books 1-9. '54-'56 39:64; 40:242; 41:336

Craig, Gerald S., Burke, Agnes, Baldwin, Sara E., Hurley, Beatrice D., Condry, Margaret G. and Johnson, Goldie Pathways in Science (6 vols.). '32 16:429

Davis, Ira C., Burnett, John and Gross, E. Wayne Science: A Story of Observation and Experiment; Books 1 and 2. '54 39:236

Davis, Ira C. and Sharpe, Richard W. Science: A Story of Discovery and Progress. '47 31:274

Deming, Frank R. and Nerden, Joseph T. Teachers Manual for Science in the World of Work (Vols. I and II). '36 20:185

Dowling, Thomas J., Freeman, Kenneth, Lacy, Nan and Tippett, James S. Understanding Science Series. '56 41:336

Elhuff, Lewis General Science, First Course. 1:242-43

Fall, Delos Science for Beginners. 2:306; 2:415

Fischler, Abraham S., Lowery, Lawrence F. and Blanc Sam S. Beginning Science Materials, Beginning Science Charts, Progress Book for Beginning Science, Teacher's Guide for Beginning Science. A Modern Approach. '66 51:409

Fischler, Abraham S., Lowery, Lawrence F. and Blanc, Sam S. Science. A Modern Approach, Books 1-6 and Teacher's Editions. '66 51:408

Fowler, George W., Collister, Morton C. and Thurston, Ernest L. Science and You; Living with Science. '52 37:345

Frasier, George Willard et al. The Scientific Living Series. '39 22:333; 23:352

Frasier, George Willard, MacCracken, Helen Dolman and Armstrong, Lois Gabel Scientific Living Series; How and Why Science Series. '47 32:288

Gruenberg, Benjamin C. and Unzicker, Samuel P. Teachers Manual for Science in Our Lives. '39 24:240

Hansen, Elizabeth and Ipsen, David C. Elementary School Science Project, Embryology: A Comparative Study of the Development of Human and Chick Embryos. '61 51:400

Hessler, John C. Junior Science, Book I. 4:476

Hessler, John C. The First Year of Science. 1:243-44

Hodgdon, D. R. Elementary General Science. 2:470

Hodgdon, D. R. Junior General Science. 6:418

Hodgdon, Daniel R. and Sachs, Morris Nelson Life Activities; Man's Environment, and Creative Science. '39 25: 350-51

Humphries, Pauline A. and Hosey, Gertrude Romance of the Airman. '31 16:258

Hunter, Geo. W. and Whitman, W. G. Civic Science in the Community. 6:418

Hunter, G. W. and Whitman, W. G. Civic Science in the Home. 5:184

Hunter, George W. and Whitman, Walter G. Doorways to Science. '47 31:274

Hunter, George W. and Whitman, Walter G. My Own Science Problems; Science in Our Social Life; Science in Our World of Progress. '35 19:136-37

Knox, Warren, Stone, George, Meister, Morris and Noble, Doris The Wonderworld of Science Book One, Book Two, and Book Three. '40 24:353

Lake, Charles H. General Science. 2:359

MacCracken, Helen Dolman, Decker, Donald G. and Ballou, Mildred T. Science Through Discovery 1. Science Through Discovery 2. Science Through Discovery 3. Teacher's Edition Sampler Science Through Discovery 1. '67 51:412

Marshall, J. Stanley and Beauchamp, Wilbur L. Teacher's Guidebook for Science Is Books 1-6. '68 52:(3)IBC

Meister, Morris Living in a World of Science, I-IV. '30-'31 15:276

Meister, Morris Living with Science Series, Books I-III. '39 24:175

Meister, Morris, Keirstead, Ralph E. and Shoemaker, Lois M. Science for a Better World. '52 37:340-41

Meister, Morris, Keirstead, Ralph E. and Shoemaker, Lois M. Teacher's Manual for Science for a Better World. '54 39:67

Meister, Morris, Keirstead, Ralph E. and Shoemaker, Lois M. The Wonderworld of Science, Books 7-9. '44-'46 30:171; 30:252

Nichols, M. Louise Science for Boys and Girls. 9:280

Novak, Joseph D., Meister, Morris, Knox, Warren W. and Sullivan, Dorothy W. The World of Science Series, Books 1-6 and Teacher's Editions. '66 51:407

Oxenhorn, Joseph M., Idelson, Michael N. and Greenleaf, Peter Pathways in Science. '68-'71 56:282

Parker, Bertha Morris Basic Science Education Series. Matter and Molecules; The Science of Building; How We Are Built. '47 33:303

Patterson, Alice J. Studies in Science. 4:476

Pease, Clara A. A First Year Course in General Science. 1:245-46

Pieper and Beauchamp Everyday Problems in Science. 10:358

Pieper, Charles John and Beauchamp, Wilbur Lee Everyday Problems in Science: Revised Edition. '33 17:342

Powers, S. R., Neuner, Elsie and Bruner, H. B. A Survey of Science Series, Books 1-3. '34-'35 18:187; 18:250; 20:109

Powers, S. R., Neuner, E. F., Bruner, H. B. and Bradley, J. H. Adventuring in Science Series. '40 24:354

Powers, Samuel Ralph, Neuner, Elsie Flint, Bruner, Herbert Bascom and Bradley, John Hodgdon Adventuring in Science Series. '46 31:181

Reed, W. Maxwell The Earth for Sam. '30 17:259

Reh, Frank and Wheat, Frank M. Science and Life, Books 1-6. '38-'39 23:395

Ring, Thomas J., Freeman, Kenneth, Dowling, Thomas I., Lacy, Nan and Tippett, James S. Understanding Science Series, Books 1-6. '51 36:193; 37:268

Rohan, Ben J. Exploratory Science, A Means of Life Guidance. '31 16:257

Rowell, Percy E. Elementary General Science, Book I. 1:246

Rowell, Percy E. Introduction to General Science with Experiments. '13 1:246

Schneider, Herman and Nina Let's Find Out. '46 31:116

Schneider, Herman and Nina Heath Elementary Science Series, Books 1-6. '54-'55 39:65; 39:66; 40:242

Schneider, Herman and Nina This Is Science in Action. '65 50:48C

Smith Everyday Science Projects. 10:434

Smith, Herbert A., Blecha, Milo K. and Sternig, John Science 1-6 (Teacher's Edition). 51:411

Smith, Paul E. and Wood, George C. Carpenter and Wood's Our Environment Series. '52 37:341

Smith, Victor C., Clarke, Katherine and Henderson, Barbara Elementary Science Series, Books 1-9. '56 41:240; 41:336

Smith, Victor C., Clarke, Katherine and Henderson, Barbara Science for Modern Living Series, Books 1-9. '51 36:60; 36:193

Smith, Victor C. and Jones, W. E. General Science. '55 41:83

Smith, Victor C. and Trafton, Gilbert H. Science in Modern Life Series. '42 27:45

Smith, Victor C. and Vance, B. B. Science for Everyday Use. '54 39:237
Snyder, William H. First Year Science. 1:246-47
Snyder, William H. Everyday Science. 4:297
Stout, A. B. Gardening. 6:568
Teeters, W. R. and Heising, Clara M. Early Journey in Science, Books 1-3. '31 18:57
Thurber, Walter A. Exploring Science, Books 1-6. '55 41:338-39
Trafton, Gilbert H. Science of Home and Community. 4:475
Trafton Science of Home and Community. 10:588
Ware, Kay L. and Hoffsten, Gertrude B. Do You Know? Things Around You. You Find Out. The World About You. This Earth of Ours. Learning to Use Science. Exploring Our World. Scientific Living Today. 51:414
Washburne, Carlton W. Common Science. 5:49
Watkins, Ralph K. and Perry, Winifred Science in Our Modern World, Books 1-3. '40 24:353
Webb and Didcoct Early Steps in Science. 9:278
Weed, Henry T. and Rexford, Frank A. Useful Science. '31 16:252
Weed, Henry I. and Rexford, Frank A. Useful Science, Book II. '31 17:256
Wong, Harry K. and Dolmatz, Melvin S. Physical Science: Ideas and Investigations in Science. '71 55:588
Wood, George C. and Carpenter, Harry A. Our Environment. '34 19:42
Wood, George C. and Carpenter, Harry A. Our Environment: How We Use and Control It. '46 31:276
Unit Studies in the Natural Sciences. '33 20:235

b. Geography

Atwood, Wallace W. and Thomas, Helen Goss Neighborhood Stories; Visits in Other Lands; The American Nations; Nations Overseas; The United States in the Western World. '45 32:382
Barrows, Harlan H., Parker, Edith Putnam and Sorenson, Clarence Woodrow Our Big World; The American Continents; Old World Lands. '46-'47 31:109; 32:294
Chamberlin, James F. Home and World Series. 8:376; 8:600
Dryer, Charles R. Elementary Economic Geography. 2:415
Emerson, Phillip The Geography of New England. 7:143
Hanna, Paul R. and Kohn, Clyde F. Cross-Country. '50 34:340
Knowlton, P. A. First Lessons in Geography 9:65
Knowlton, P. A. Introduction to World Geography. 12:419
Jordan, David Starr High Lights of Geography. 10:356
Long, Forest E. and Halter, Helen Social Studies Skills. '54 39:171
Miller, George J. (Editor) Activities Geography. '37 22:232
Packard and Sinnott Nations as Neighbors. 10:360
Ridgley, Douglas C. and Ekblaw, Sidney E. Problems in Economic Geography. '38 23:174
Sauer, Carl Man in Nature, a First Book in Geography. '39 24:357
Smith, J. Russell Our Country and Northern Neighbors; Our European Neighbors; Other World Neighbors; Our Industrial World. '34 21:53
Stull, DeForest and Hatch, Roy W. Our World Today Geographics Series. '48 32:381
Taylor, Frank J. and Taylor, Ruth Our U.S.A.--A Gay Geography. '35 21:123
Weinberg, Louis, Scott, Zenos E. and Holston, Evelyn T. The World We Live In. '32 18:123-24
Whipple, Gertrude and James, Preston E. Our Earth; Using Our Earth; Our Changing Earth; Living on Our Earth; At Home on Our Earth; Neighbors on Earth; Our Earth and Man. '55 41:337
Wiedefeld, M. Theresa and Walther, E. Curt Wiedefeld-Walther Geography Test, A & B. '31 15:274
Winslow, L. L. Elementary Industrial Arts. 6:569

c. Health

Bigelow, Maurice A. and Broadhurst, Jean Health for Every Day. 9:140
Bigelow, Maurice A. and Broadhurst, Jean Health in Home and Neighborhood. 9:140
Brown, Bertha M. Health in Home and Town. 2:471
Brownell, Clifford Lee and Evans, Ruth Broad Streets. '53 38:109
Brownell, Clifford Lee, Ireland, Allen Gilbert, Giles, Helen Fisher and Towne, Charles Franklin Health and Safety Series. '35 23:55

Charters, W. W., Smiley, Dean P. and Strang, Ruth M. Your Health and Growth Series. '55 41:338
Corwin, Walling and Corwin, Mae Johnson The Science of Human Living: Hygiene. '31 16:253
Davison, Alvin Health Lesson; Revised. 9:206
Gregg, F. M. and Rowell, H. G. Health Studies (2 vols.). '32 17:253
Hallock, Grace T., Allen, Ross L. and Thomas, Eleanor Health for Better Living Series. '54 43:84
Merideth, Florence I. The Health of Youth. 13:56
O'Shea, M. V. and Kellogg, J. H. The Everyday Health Series: Book 1, Building Health Habits; Book 2, Keeping the Body in Health. '21 6:497
Overton, Frank Personal Hygiene. 8:631
Overton, Frank General Hygiene. 8:531
Ritchie, John W. Sanitation and Physiology. '17 2:471
Towse, Anna B. et al. Curriculum Foundation Series, Health Stories, Books 1, 2, and 3. '34-'35 18:187; 18:253; 21:117
Wheat, Frank Merrill and Fitzpatrick, Elizabeth T. Everyday Problems in Health. '33 17:346
Williams, Dorothea M. Building Health. '52 37:345
Williams, Dorothea M. Building Health. '56 41:342
Williams, Jesse F. Person Hygiene Applied. 7:71

d. Nature Study and Agriculture; Science Readers

Beaty, John Y. The River Book. 31:115
Beaty, John Y. The Mountain Book. '44 31:115
Beauchamp, Wilbur L., Crampton, Gertrude and Gray, William S. Guidebook for Look and Learn. '43 27:80
Beauchamp, Wilbur L., Crampton, Gertrude and Gray, William S. All Around Us and How Do We Know (Teachers Edition). '44 30:177
Beauchamp, Wilbur L. et al. Science Stories Series. '33-'37 18:252; 21:117; 21:259; 22:272
Beauchamp, Wilbur L. and West, Joe Young Curriculum Foundation Series. Science for Children (Teacher's Guide). '35 22:272
Bloch, Marie Herbert the Electrical Mouse. '53 39:76
Carpenter, Harry A. et al. Rainbow Series in Elementary Science. '39-'41 23:351; 24:353; 26:216
Carpenter, Harry A. et al. Rainbow Series in Elementary Science. '48 33:77
Clarke, Francis E. Our Animal Books Series. '37 22:328
Colvin, Carl and Stevenson, J. A. Farm Projects. 7:73
Dougan, Lewis M. Stories of Outdoor Science. '33 18:255
Duncan, F. Martin and Duncan, L. T. The Wonders of Nature Series (24 vols.). '30-'35 21:51
Engleman, F. E. and Salmon, Julia Air Ways. '31 16:434-35
Fisher, Clyde and Langham, Marion L. Nature Science: Book 1, World of Nature; Book 2, Ways of the Wild Folk; Book 3, Our Wonder World; Book 4, In Field and Garden. '34 19:137
Gehrs, John H. Agricultural Nature Study, Book I. '29 14:468
Gehrs, John H. Nature Study, Book II. '30 15:70
Gordon, Eva L. and Hall, Jenny Nature Stories for the Children. '26-'27 12:570
Hallock, Grace T. After the Rain. 12:422
Heal, Edith and Others The Story of the World Series. '30 16:331-32
Holden, E. S. The Sciences, Revised Edition. 11:212
Howard, Ethel K. How We Get Our Food. '39 24:179
Huber, Miriam et al.; Arey, Charles K. Aviation Readers Series. '43-'44 30:179
Lent, Henry B. Straight Up; Straight Down. '45 30:178
McIntosh, D. C. and Orr, D. M. (Editors) First Problems in Agriculture. '34 19:43
McKay, Herbert In Search of Science: Book I, Air, Wind and Rain; Book II, Looking-Glasses and Candles; Book III, Noises, The Sun and the Moon. '38 24:353
Moseley, Edward L. Trees, Stars, and Birds. 3:239
Nicol, Lucille, Levenson, Samuel M. and Kahn, Teressa The Nature Hour: Fifth Year-Spring; Fifth Year-Autumn and Winter; Sixth Year-Spring; Sixth Year-Autumn and Winter. '35 20:51
Paine, E. George et al. Elementary Science Readers. '27-'28 12:572; 13:117
Parker, Bertha M. and Cowles, Henry C. The Book of Plants. 10:354
Parker, Bertha Morris Basic Science Education Series. '46 31:105
Patch First Lessons in Nature Study. 11:66
Patch, Edith M. and Howe, Harrison E. Science at Home. '34 19:89

Patch, Edith M. and Howe, Harrison E. Nature and Science Readers. '32-'33-'35 17:161; 18:54; 20:51
Patterson, Alice J. Nature Study and Health Education Series. '26-'28 12:570; 13:117
Persing, Ellis C. and Wildman, Edward E. Elementary Science by Grades, Book 4. '29 14:386
Phillips, Mary G. and Wright, Julia M. Nature by Seaside and Wayside Series. '36 21:50
Reh, Frank Science Related to Life: Book I, Water, Air and Sound; Book II, Heat and Health; Book III, Magnetism and Electricity; Book IV, Light, Forces and Machines. '32 18:55
Schackelford, Frederick H. Earth and Sky Trails. '34 20:233
Shirling, A. E. Outdoor Adventures. '28 13:186
Stone, George and Noble, Doris The Wonderworld Readiness. '48 42:378
Thomas, Roy H. Living Things Around Us. '28 17:259
Thorn, Samuel A. and Brouillette, Jeanne Let's Go; Let's Try. '53 39:85
Thorn, Samuel A. and Duncan, Carl D. Let's Learn How. '56 43:85
Trafton, Gilbert N. Nature Study and Science. 12:419
University of Florida, Project in Applied Economics Science Readers Series. '47 32:219; 33:310
W.P.A. Writer's Program Children's Science Series. '40 24:178; 24:353; 25:171
Wyler, Rose (Editor) Everyday Science Series. '53 37:284
Book of the Discovery Series. '66 51:398
Keystone Primary Series. 21:170
Nature Activity Readers. '31-'37 15:197; 22:50
New Science Reading Adventures Books 1, 2, 3, 4, 5, and 6. '65 51:398
Trails Today Series. '32 18:53

e. Laboratory Manuals (includes workbooks and review books)

Beauchamp, Wilbur L., Mayfield, John C. and West, Joe Y. A Study-Book for Science Problems 3. '41 25:408
Beauchamp, Wilbur L., Mayfield, John C. and West, Joe Young A Study-Book for Science Problems. '40 25:114
Blackwood, Paul E. Experience in Science. '50 34:325
Blackwood, Paul E. Experiences in Science. '55 40:78
Boyer, Philip A., Clark, Arthur S., Gordon, Hans C., Schilling, John Experiences in General Science. '45 30:105
Boyer, Philip A., Clark, Arthur S., Gordon, Hans C., Schilling, John Experiences in General Science. '45 30:105
Boyer, Philip A., Clark, Arthur S., Gordon, Hans C., Schilling, John Experiences in General Science. '45 30:105
Caldwell, L. L. and McAtee, Veva 20th Century Workbook in General Science. '30 20:236
Carpenter, H. A. and Wood, George C. Science Discovery Book. '33 18:187
Clark, B. F. and Hendrickson, George O. Nature Science Series: Book I, Nature Study; Book II, Nature Study; Book III, Elementary Science. '31-'34 20:235
Craig, Gerald S. et al. Science for You, Books One Through Seven. '65 52:312
Davis, Ira C. Directed Study Guide and Manual. '36 21:120
Davis, Jerome F., Hutchings, Verne and Sharpe, Clarence P. A Directed Study Guide in General Science. 22:327
Doss, Leona, Townsend, Rebecca and Townsend, Katherine Steck-Vaughn Health Series: Growing Up, Growing Every Day, Steps to Health, Exploring Health, and Health for Everyday. 51:412
Editors of Scholastic Magazines. Map Skills Project, Book I; Map Skill Projects, Book II. '64 50:4BC
Fiedler, Evelyn A. The World We Live In: Book Four, Book Five, Book Six. '46 32:288-89
Fiedler, Evelyn A. The World We Live In: Book Seven. '47 32:289
Harpster, C. E. Supplementary Studies in Nature Science, Books I and II. '37 22:210
Hudspeth, Jack and Hudspeth, Frances H. Elementary Science Workbooks and Handbooks for Teachers. '38-'40 23:55; 24:177; 24:353
Hudspeth, Jack and Steel, Mary The World About Us; Life on Our Earth; Teacher's Manual for Life on Our Earth; Teacher's Manual for the World About Us. '48 33:302-03
Hunter, George W. and Whitman, Walter G. Laboratory Exercises for My Own Science Problems (7th year); Laboratory Exercises for Science in Our World of Progress (9th year). '35 20:48
Lowe, Dr. Joe, Parker, F. W. and Brown, B. P. Laboratory Manual for Science 3, 4, 5, and 6. '66-'67 51:412
New York University COPES, Water-Mix Experiments: COPES (Teacher's Guide). '72 57:101-02

Patterson, Alice J. Notebooks for Nature Study and Health Education. '28 12: 572; 13:117
Petersen, Charles F. Fundamentals of Electricity. '36 21:212
Powers, Samuel R., Neuner, Elsie F. and Bruner, Herbert B. Directed Activities I. '35 20:109
Powers, S. R., Neuner, Elsie F. and Bruner, Herbert B. Directed Activities II and Directed Activities III. '36 21:169
Prucha, Katharine E. Laboratory Exercises in Elementary Science. 3:52
Renkel, R. A. Workbook for Elementary Agriculture. '38 23:354
Ruchlis, Hy Teacher's Manual for Classroom Laboratory 1-6. '66 51:410
Snyder, W. H. Manual and Notebook to Everyday Science. 5:50
Steel, Mary and Hudspeth, Jack Do You Know? '46 31:105; 32:288
Steel, Mary and Hudspeth, Jack Things Around Us. '47 32:288
Vinal, W. G. Tree Calendar, Key and Checklist; Bird Calendar, Key and Checklist. '37 22:50
Watkins, Ralph K. and Perry, Winifred Workbooks for Science in Our Modern World. '40 24:354
W. M. Welch Scientific Company Elementary Experiments in Science. '55 41:345

2. Textbooks for the High School Student
a. Biology and Applied Biology (includes agriculture, domestic science, and hygine)

Adell, James C., Dunham, Orra Olive and Welton, Louis E. Explorations in Biological Science. 22:326
Anderson, C. L. and Langton, C. V. Health Principles and Practices. 49:114
Atwood, W. H. Biology. 12:354
Atwood, William H. Civic and Economic Biology. 7:139, 141
Baker, Arthur O. and Mills, H. Dynamic Biology. '33 18:53
Baker, A. O. and Mills, L. H. Dynamic Biology. '38 23:396
Barrows, William M. Science and Animal Life. 12:493
Bayles, Ernest E. and Burnett, R. Will Biology for Better Living. '46 31:38
Benedict, Ralph C., Knox, Warren W. and Stone, George K. High School Biology. '38 22:221
Benedict, Ralph C., Knox, Warren G. and Stone, George K. Life Science. '41 25:408
Borradaile, L. A., Potts, F. A., Eastham, L. E. S. and Saunders, J. T. The Invertebrata. '35 20:118
Brown, William H. A Text Book of General Botany. 10:434
Burnett, R. Will To Live in Health. '46 31:38
Bush, George L., Dickie, Allan and Runkle, Ronald C. A Biology of Familiar Things. '39 23:291
Carleton, Robert H. and Williams, Harry H. Modern-Life Science. '42 27:45
Carver, Thomas Nixon, Woolman, Mary Scherick and McGowan, Ellen Beers Textile Problems for the Consumer. '35 19:195-96
Clemensen, Jessie Williams and LaPorte, William Ralph Your Health and Safety. '46 30:323
Clemensen, Jessie Williams and LaPorte, William Ralph Your Health and Safety. '52 37:344-45
Cobb, Walter Frank Health for Body and Mind. '36 21:118
Conn, H. W. Bacteria, Yeasts, and Molds in the Home. '32 17:81
Corwin, Walling and Corwin, Mae Johnson Living Things. '34 20:186
Craig, Edna and Stone, George K. Guide to High School Biology. '38 22:221
Curtis, F. D., Caldwell, O. W. and Sherman, N. H. Biology for Today. '34 18: 185-86
Curtis, Francis D., Caldwell, Otis W. and Sherman, Nina Henry Everyday Biology. '40 24:353
Curtis, Francis D., Caldwell, Otis W. and Sherman, Nina Henry Teacher's Manual and Key for Biology for Today. '34 19:43
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Skinner, B. F. Science and Human Behavior. '53 38:436
Slaughter, Frank G. The New Science of Surgery. '46 31:340
Spicer, Edward H. Human Problems in Technological Change. '65 51:417
Spivack, Morris J. Associative Evolution. '51 36:310
Sullivan, J. W. N. The Limitations of Science. '33 20:184
Sullivan, J. W. N. The Limitations of Science. '49 34:280
Symposium: George Westinghouse Centennial Science and Life in the World. '46 31:327
Toffler, Alvin Future Shock. '71 56: 438-40
Toulmin, Stephen The Philosophy of Science. '53 38:253
Ward, Harold (Editor) New Worlds in Medicine. '46 31:339
Weaver, Warren (Editor) The Scientists Speak. '47 32:222
Weidlein, Edward R. and Hamor, William A. Science in Action. '31 19:85
Wendt, Gerald Science for the World of Tomorrow. '39 24:176
Werkmeister, W. H. A Philosophy of Science. '40 25:235
Whitehead, Alfred North Essays in Science and Philosophy. '47 31:337
Whyte, L. L. The Next Development of Man. '50 34:362
Good Health Is Good Business. '48 32: 290
Serving Through Science. '46 30:320
Women in Chemistry. 7:143
Your Opportunities in Science. '52 38:417

L. Scientific Information

1. Biological Sciences and Applications

Note: Listings in each of the following categories are divided into: (1) Books for Children, (2) Books for Adults.

a. General Botany (Books for Children)

Blough, Glenn O. Discovering Plants. '66 52:79
Cosgrove, Margaret Plants in Time. '67 52:90
Dickinson, Alice The First Book of Plants. '53 39:73
DuPuy, William Atherton Our Plant Friends and Foes. '31 15:272; 16:85
DuPuy, William Atherton Wonders of the Plant World. '31 16:524
Earle, Olive L. The Strangler Fig and Other Strange Plants. '67 52:95
Guilcher, J. M. and Noailles, R. H. A Fruit Is Born. 52:81
MacDougal, D. T. The Green Leaf. '30 15:74
Miner, Irene The True Book of Plants We Know. '53 38:112-13
Murrill, William Alphonso Familiar Trees; Flowers. '46 31:110
Podendorf, Illa The True Book of Weeds and Wild Flowers. '55 41:350
Schneider, Herman and Nina Plants in the City. '51 36:200
Selsam, Millicent E. Milkweed. '67 52: 94
Selsam, Millicent E. Plants that Heal. 52:94
Selsam, Millicent E. Plants that Move. '62 52:85
Selsam, Millicent E. The Plants We Eat. '55 41:362
Selsam, Millicent E. Play with Leaves and Flowers. '52 37:271
Selsam, Millicent E. Play with Plants. '49 34:68; 34:140

Selsam, Millicent E. Play with Seeds. '57 41:362
Selsam, Millicent E. Play with Vines. '51 37:283
Swift, Howard W. The Wonderful World of Plants and Flowers. '67 52:505
Vallin, Jean The Plant World. '67 52: 510
Webber, Irma E. Bits that Grow Big. '49 33:304
Webber, Irma E. Travelers All. '44 30: 179
Zim, Herbert S. What's Inside of Plants? '52 37:270

a. General Botany (Books for Adults)

Andrews, Henry N., Jr. Ancient Plants and the World They Lived in. '47 33:84
Bailey, L. H. The Garden of Bellflowers in North America. '53 39:182
Bailey, H. L. How Plants Get Their Names. '33 19:86
Bingham, Marjorie T. Flora of Oakland County, Michigan. A Study of Physiographic Plant Ecology. '45 29:280
Campbell Outline of Plant Geography. 11:62
Christensen, Clyde M. Common Edible Mushrooms. '43 26:183
Clute, Willard N. The Useful Plants of the World. '32 19:193
Fassett, Norman C. A Manual of Aquatic Plants. '40 25:119
Fernald, Merritt Lyndon Gray's Manual of Botany. '50 34:342
Fox, Helen M. The Years in My Herb Garden. '53 38:183
Hylander, Clarence J. The World of Plant Life. '39 23:294
Hylander, Clarence J. The World of Plant Life. '56 41:244-45
Kamm, Minnie Watson Old-Time Herbs for Northern Gardens. '38 23:114
Lucas, Janette May and Carter, Helene Indian Harvest: Wild Food Plants of America. '45 30:307
McCubbin, W. A. Fungi and Human Affairs. 9:136
Medsger, Oliver Perry Edible Wild Plants. '39 24:179
Morton, Julia F. and Redin, R. Bruce 400 Plants of South Florida. '52 38:106-07
Muenscher, W. C. Weeds. '35 20:113
Muenscher, Walter Conrad Weeds. '56 41:252
Nicol, Hugh Plant Growth Substances. '39 25:293-94
Novak, F. A. The Pictorial Encyclopedia of Plants and Flowers. '66 52:(4)IBC
Peattie, Donald Culross Flowering Earth. '39 24:413
Quinn, Vernon Leaves, Their Place in Life and Legend. '37 22:332
Riedman, Sarah R. Grass: Our Greatest Crop. '52 38:256
Robbins, Wilfred W. and Pearson, Helen M. Sex in the Plant World. '33 19:86
Robbins, Wilfred William and Ramaley, Francis Plants Useful to Man. '37 22:161
Shepherd, Roy E. History of the Rose. '54 39:182
Stanford, Ernest Elwood Economic Plants. '34 22:161
Stemen, Thomas R. and Myers, W. Stanley Oklahoma Flora '37 21:222
Tryon, Rolla M., Jr. The Ferns and Fern Allies of Minnesota. '54 39:249
Verrill, A. Hyatt Wonder Plants and Plant Wonders. '39 24:179
Yocum, L. Edwin Plant Growth. '45 30: 169

b. Botany — Trees and Flowers (Books for Children)

Beaty, John Y. Trees. '38 25:410-11
Billington, Elizabeth T. Adventure with Flowers. '66 52:80
Collingwood, G. H. Knowing Your Trees. '37 23:294
Cormack, M. B. The First Book of Trees. '51 38:113
Friesner, Gladys M. and Hill, Marian J. Wild Flowers of Spring; Wild Flowers of Summer and Late Autumn. 52:507
Guilcher, J. M. and Noailles, R. H. (Transl. Egan and Rollin) A Tree Grows Up. '72 57:95
Harvey, Jane Wild Flowers of America. '32 20:113
Hylander, Clarence J. Trees and Trails. '53 38:255
Kauffman, Erle Kingdom of the Trees. '40 25:172
Kieran, John An Introduction to Trees. 40:243
Oppenheim, Joanne Have You Seen Trees? '67 53:179
Peattie, Donald Culross Trees You Want to Know. '34 20:113

Podendorf, Illa The True Book of Trees. '54 39:74
Potzger, J. E. What Tree Is That? 52: 507
Selsam, Millicent E. Play with Trees. '50 34:267
Zim, Herbert S. and Martin, Alexander C. Flowers. '50 37:269
Zim, Herbert S. and Martin, Alexander C. Trees. '52 37:270

b. Botany — Trees and Flowers (Books for Adults)

Blakeslee, Albert Francis and Jarvis, Chester Deacon Trees in Winter. '31 20:113
Cheyney, E. G. What Tree Is That. '30 16:251
Clements, Edith S. Flowers of Prairie and Woodland. '47 32:224
Everett, T. H. A Guide to Field Flowers; A Guide to Garden Flowers; A Guide to Woodland Flowers. 33:304
Felt, Ephraim Porter Our Shade Trees. '38 23:230
Fischer, Helen Field and Horshbarger, Gretchen The Flower Family Album. '41 26:55
Fry, Walter and White, John R. Big Trees. '38 23:113
Green, Charlotte Hilton Trees of the South. '39 24:299
Green, George Rex Trees of North America. Vol. 1--The Conifers. '33 17:343
Green, George Rex Trees of North America. Vol. 2--The Broadleaves. '34 19:139
Hausman, Ethel Hinckley Beginner's Guide to Wildflowers. '48 32:291
Heslop-Harrison New Concepts in Flowering-Plant Taxonomy. '56 41:258
Hough, Romeyn B. Handbook of the Trees of the Northern States and Canada. '47 32:55
Jaques, H. E. How to Know the Trees. '40 25:118-19
Jegar, Edmund C. Desert Wild Flowers. '40 25:119
King, Julius Wild Flowers at a Glance. '35 20:113
King, Julius Talking Leaves. '34 20: 113
Mathews, F. Schuler Familiar Flowers of Field and Garden. '37 23:113-14
McFarland, J. Horace Modern Roses III. '47 33:78
Moldenke, Harold N. American Wild Flowers. '50
Percival, Olive Our Old-Fashioned Flowers. '50 34:343
Pool, Raymond J. Flowers and Flowering Plants. '29 14:658
Preston, Richard J., Jr. North American Trees. '48 33:78-79
Quick, Arthur Craig Wild Flowers of the Northern States and Canada. '39 24: 413
Randall, Charles E. and Edgerton, D. Priscilla Famous Trees. '38 23:113
Rosendahl, C. O. and Butters, F. K. Trees and Shrubs of Minnesota. '29 20:185
Sitwell, Sacheverell Old Fashioned Flowers. '39 24:413
Stefferud, Alfred How to Know the Wild Flowers. '50 34:342-43
Werthner, William B. Some American Trees. '35 20:114

c. General Zoology (Books for Children)

Andrews, Roy Chapman Nature's Ways. '51 38:108
Beatty, John Y. and Allen, J. C. On Our Farm. '32 18:198
Blough, Glenn O. After the Sun Goes Down. '56 43:284
Blough, Glenn O. Who Lives in This House? '57 44:154
Boulenger, E. G. Infants of the Zoo. '34 20:186
Bridges, William Zoo Pets. '55 41:348
Brown, Vinson How to Make a Miniature Zoo. '56 41:347
Bullough, William and Helena Introducing Animals. '54 43:82
Bullough, William and Helena Introducing Animals with Backbones. '55 43:82
Chace, Lynwood M. Look at Life! '40 25:176
Colby, C. B. The First Book of Animal Signs. '66 52:(1)IBC
Colby, Carroll Who Lives There? '53 39:83
Colby, Carroll Who Went There? '53 39:83
Chalmers, Sir Peter Mitchell The Childhood of Animals. 25:411-12
Dawson, Mildred A. Farm Animals. '46 31:106
Ditmars, Raymond L. Strange Animals I Have Known. '31 16:519
Ditmars, Raymond L. and Bridges, William Wild Animal World: Behind the Scenes at the Zoo. '37 23:56
Ditmars, Raymond L. and Carter, Helene The Book of Zoography. '34 20:188
Dupuy, Wm. Atherton Our Animal Friends and Foes. '40 25:177-78

Earle, Clive L. Paws, Hoofs, and Flippers. '54 41:361
Erickson, Phoebe The True Book of Animals of Small Pond. '53 38:112
Eschmeyer, R. W. Willie Whitetail, Freddy Fox Squirrel, Bob White, Charley Cottontail, Woody Woodcock, Tommy Trout, Billy Bass, Bobby Bluegill. '53 & '52 38:110
Fenton, Carroll Lane Wild Folk in the Woods. '52 39:87
Fabell, Walter C. Nature Was First. '52 38:111
Fox, Charles Philip Opie Possum's Trick. '68 52:509
Gibson, Derlyne How Fast Can It Go? '67 52:80
Gray, James How Animals Move. '53 39:88
Green, Ivah Animal Masquerade. '54 43:378
Green, Ivah Animals Under Your Feet. '53 39:85
Hegner, Robert Parade of the Animal Kingdom. '35 22:162
Hogner, Dorothy Childs and Hess, Lilo Odd Pets. '51 37:283
Holme, Bryon A Book of Animals. '40 25:171-72
Huey, Edward G. A Child's Story of the Animal World. '35 20:187
Ipcar, Dahlor Animal Hide and Seek. '47 32:290
Kay, Helen How Smart Are Animals? 52: 517
Lewellen, John Farm Animals. '54 39:75
Leyson, Captain Burr W. and Manecke, Ruth The Zoo Comes to You. '54 39:89
Mannheim, Grete Farm Animals. '64 49: BC
Mason, George F. Animal Clothing. '55 41:364
Mason, George F. Animal Habits. 52: 93-94
Mason, George F. Animal Tools. '51 37:284
Mason, George F. Animal Weapons. '49 33:380
Merriam, Eve Small Fry. '65 49:498
Morgan, Ann Haven Field Book of Animals in Winter. '39 24:179
Morris, Johnny and Shackleton, Keith Animal Magic. '67 51:404
Neurath, Marie Too Small to See. '56 44:155
Palazzo, Tony and Fox, Robin A Passel of Possums and Other Farm Families. '68 52:518
Pinner, Erna Curious Creatures. '53 39:89
Podendorf, Illa Pets. '54 39:74
Purcell, John Wallace The True Book of African Animals. '54 39:75
Russell, Solveig Paulson Which Is Which? '66 52:98
Sander, Lenore Animals That Work for Man. '63 49:BC
Selsam, Millicent All About Eggs. '52 37:271
Selsam, Millicent All Kinds of Babies and How They Grow. '53 37:290
Selsam, Millicent E. How Animals Tell Time. '67 52:85
Selsam, Millicent How the Animals Eat. '55 43:283
Shaw, Margaret and Fisher, James Animals as Friends. '40 26:111
Shuttlesworth, Dorothy Animal Camouflage. '66 52:101
Thorne, Diana 101 Favorite Animals and Birds. '53 39:84
Weil, Ann Animal Families. '46 31:115
Workers of the WPA Federal Writers' Project in the City of New York. Who's Who in the Zoo. '38 23:112
Wright, Helen and Rapport, Samuel Great Adventures with Animals. '67 52:86
Zim, Herbert S. What's Inside of Animals? '52 37:291

c. General Zoology (Books for Adults)

Borrdaile, L. A. The Animal and Its Environment. 7:299
Brown, Emerson C. My Animal Friends. 20:230
Colbert, Edwin H. Evolution of the Vertebrates. '69 55:98
Cutright, Paul Russel The Great Naturalists Explore South America. '40 25: 295
Ditmars, Raymond L. The Fight to Live. '38 23:56-57
Ditmars, Raymond L. and Bridges, William Wild Animal World--Behind the Scenes of the Zoo. '37 21:260
Dufresne, Frank Alaska's Animals and Fishes. '46 31:112
Lyne, Gordon Marsupials and Monotremes of Australia. '68 52:507
Pennak, Robert W. Collegiate Dictionary of Zoology. '64 52:517
Poignant, Axel Animals of Australia. '67 51:406
Seton, Ernest Thompson Wild Animals I Have Known. '46 32:47
Shoosmith, F. H. Life in the Animal World. '38 24:358
Vanden Eeckhoudt, J. P. Secret Life of Small Animals. '72 57:244
Waddington, C. H. How Animals Develop. 52:89
Willier, Benjamin H., Weiss, Paul A. and Hamburger, Viktor Analysis of Development. '55 39:247

d. Zoology — Invertebrates (Books for Children)

Adrian, Mary Garden Spider. '51 37: 144
Adrian, Mary Honeybee. '52 37:276
Blough, Glenn O. Discovering Insects. '67 52:506
Conklin, Gladys I Like Butterflies. 53:176
Earle, Olive L. Crickets. '56 41:362
Fenton, Carroll Lane and Pallas, Dorothy Constance Insects and Their World. '56 43:375
Frey, Nina A. Lasius, The Lucky Ant. '38 23:397
Hogner, Dorothy Childs Earthworms. '53 39:78
Hussey, Lois J. and Pessino, Catherine Collecting Cocoons. '53 39:78
Kenly, Julie Closson Little Lives. '38 23:17
Kenly, Julie Closson Voices from the Grass. 25:171
King, Eleanor and Pressels, Wellmer Insect Allies. '38 23:57
King, Eleanor and Pressels, Wellmer Insect People. '37 24:358
Lane, Ferdinand C. All About the Insect World. '54 41:359-60
Lewellen, John The True Story of Honeybees. '53 38:112
Marcher, Marion W. Monarch Butterfly. '54 39:84
McIntire, Alta Butterflies and Moths. '38 24:178
McClung, Robert M. Green Darner. '56 41:363
McClung, Robert M. Luna. '57 41:364
McClung, Robert M. Sphinx. '49 33: 379-80
Podendorf, Illa The True Book of Insects. '54 39:74
Politi, Leo The Butterflies Come. '57 43:278
Potzger, J. E. and Whitney, Margaret Esther Insects and Some of Their Relatives. 52:507
Rarig, Frances H. The Ant Queen's Home and Other Stories. '32 18:125
Schatz, Albert and Riedman, Sarah R. The Story of Microbes. '52 39:90
Sears, Paul McCutcheon Firefly. '56 43:377
Selsam, Millicent E. Microbes at Work. '53 39:71
Stepp, Ann A Silkworm Is Born. '72 57:243
Teale, Edwin Way The Boys' Book of Insects. '39 24:298
Tibbets, Albert B. The First Book of Bees. '52 38:113-14
Verrill, A. Hyatt Strange Insects and Their Stories. '37 21:217
Zarchy, Harry Butterflies and Moths. '66 52:83-84
Zim, Herbert S. and Cottam, Clarence Insects. '51 36:199

d. Zoology — Invertebrates (Books for Adults)

Bates, Marston The Natural History of Mosquitoes. '49 34:208
Bayne, Jones, Stanhope Man and Microbes. '32 16:522
Bisset, K. A. Bacteria. '52 38:314
Buchsbaum, Ralph Animals Without Backbones. '38 23:232
Buchsbaum, Ralph Animals Without Backbones. '48 34:335
Carpenter A Naturalist in East Africa. 10:590
Curran, C. H. Insects of the Pacific World. '45 30:246
Dethier, Vincent G. Chemical Insect Attractants and Repellents. '47 32:226
Duncan, Carl L. and Pickwell, Gayle The World of Insects. '39 26:111; 27:44
Duncan, Winifred The Private Life of the Protozoa. '50 34:329
Duncan, Winifred Webs in the Wind. '49 34:335
Eltringham, H. Butterfly Lore. 8:531
Flint, W. P. and Metcalf, C. L. Insects: Man's Chief Competitors. '32 17:343
Friedlander, C. P. and Priest, D. A. Insects and Spiders. '56 42:95
Gaul, Albro The Wonderful World of Insects. '53 38:248
Hartnack, Hugo 202 Common Household Pests. '39 25:172-73
Haskins, Caryl P. Of Ants and Men. '39 23:296
Hegner, Robert Big Fleas Have Little Fleas. '38 22:379
Hoogstraal, Harry Insects and Their Stories. '41 25:412
Howard, L. O. The Insect Menace. '31 16:516-17
Hutchins, Ross E. The Ant Realm. '67 51:406
Imms, A. D. Insect Natural History. '51 36:311
Imms, A. D. Social Behavior in Insects. '31 16:334

Jahn, T. L. and Jahn, Frances F. How to Know the Protozoa. '50 34:325-26
Jaques, H. E. How to Know the Insects. '36 22:159
Kluyver, A. J. and Van Niel, C. B. The Microbe's Contribution to Biology. '56 41:258
Lindauer, Martin Communication Among Social Bees. '71 56:571-72
Morley, Derek Wragge The Evolution of an Insect Society. '55 41:245
Nichols, David and Cooke, John A. L. The Oxford Book of Invertebrates. '71 56:434-35
Oldroyd, Harold Insects and Their World. 52:517
Osborn, Herbert Meadow and Pasture Insects. '39 25:297
Patterson, J. T. and Stone, W. S. Evolution in the Genus Drosophila. '52 38:315
Plath, Otto Emil Bumble Bees and Their Ways. '34 19:37
Rendl, Georg The Way of a Bee. '33 19:38
Richards, O. W. The Social Insects. '53 38:246
Schwartz, George I. Life in a Drop of Water. '70 57:91-92
Smith, Kenneth M. The Virus, Life's Enemy. '40 25:29.
Stromsten, Frank A. Davison's Mammalian. '47 32:227
Sutherland, Louis The Life of the Queen Bee. '46 30:169
Swain, Ralph B. The Insect Guide. '48 33:309
Von Frisch, Karl Bees, Their Vision, Chemical Senses, and Language. '71 57:242
Von Frisch, Karl The Dance Language and Orientation of Bees. '67 53:181
Weed, Clarence M. Insect Ways. '30 16:174
Wellhouse How Insects Live. 11:65
Wichterman, Ralph The Biology of Paramecium. '53 38:315
Insect Facts. '54 39:183
Our Insect Friends and Foes and Spiders. '35 22:160

e. Zoology — Reptiles and Amphibians (Books for Children)

Adrian, Mary The American Alligator. '67 52:100
Ballard, Lois The True Book of Reptiles. '57 41:368
Bevans, Michael H. The Book of Reptiles and Amphibians. '56 43:283
Bronson, Wilfred S. Turtles. '45 30: 179
Chenery, Janet The Toad Hunt. '67 52: 88
Collins, Henry Hill, Jr. Turtles. '62 51:414
Ditmars, Raymond L. The Book of Living Reptiles. '36 22:50
Harris, Louise Dyer and Harris, Norman Dyer Slim Green. '55 43:83
Hogner, Dorothy Childs A Book of Snakes. '66 52:102
Hogner, Dorothy Childs Frogs and Polliwags. '56 43:83
Hoke, John The First Book of Snakes. '52 38:114
Leutscher, Alfred The Curious Snakes of the World. '65 50:96
McClung, Robert M. Black Jack: Last of the Big Alligators. '67 52:94
Morris, Percy A. Boy's Book of Frogs, Toads, and Salamanders. '57 41:368
Sears, Paul McCutcheon Tree Frog. '54 43:377
Staff of the Federal Writers' Project, Works Progress Administration in the City of New York Reptiles and Amphibians. '39 24:178
Zim, Herbert S. Alligators and Crocodiles. '52 37:270-71
Zim, Herbert S. Frogs and Toads. '50 34:266-67
Zim, Herbert S. Snakes. '49 33:380
Zim, Herbert S. and Smith, Hobart M. Reptiles and Amphibians. '54 39:69

e. Zoology — Reptiles and Amphibians (Books for Adults)

Bragg, Arthur N., Weese, A. O., Dundee, Harold A., Fisher, Helen Talley, Richards, A. and Clark, Carol Bergthold Researches on the Amphibia of Oklahoma. '50 34:329
Conant, Roger and Bridges, William. What Snake Is That? '39 24:414
Curran, C. H. and Kauffeld, Carl Snakes and Their Ways. '37 22:161
Ditmars, Raymond L. North American Snakes. '39 24:413
Ditmars, Raymond L. Reptiles of the World. '33 18:53
Pope, Clifford H. Amphibians and Reptiles of the Chicago Area. '44 29: 279
Pope, Clifford H. The Reptile World. '55 41:244
Pope, Clifford Snakes Alive and How They Live. '37 22:214
Savage, Jay M. Lizards, Snakes and Turtles of the Western U.S. and Canada. '49 34:270

Verrill, A. Hyatt Strange Reptiles and Their Stories. '37 22:209
Wright, A. A. and Wright, A. H. Handbook of Frogs and Toads. '33 19:138-39
Wright, Albert Hazen and Wright, Anna Allen Handbook of Frogs and Toads of the United States and Canada. '49 33:309

f. Zoology — Aquatic Animals (Books for Children)

Andrews, Roy Chapman All About Whales. '54 41:359
Adrian, Mary Fiddler Crab. '53 39:84
Beaty, John Y. The Ocean Book. '46 31:119
Broekel, Ray The True Book of Tropical Fishes. '56 41:366
Buehr, Walter Harvest of the Sea. '55 41:364
Darling, Louis Seals and Walruses. '55 41:363
Dudley, Ruth H. Sea Shells. '53 39:78
Earle, Olive L. The Octopus. '55 41: 361-62
Engleman, F. E., Salmon, Julia and McKenny, Wilma Scales and Fins. '38 27:48
Goudey, Alice E. Here Come the Whales. '56 43:278
Hanson, S. E. G. and Wells, Marjorie E. Ponds, Pools, and Puddles. '40 25: 175
Lane, Ferdinand C. All About the Sea. 41:360
McClung, Robert M. Horseshoe Crab. '67 52:94
McClung, Robert M. Leape . '57 41:364
Mellen, Ida M. Twenty Little Fishes. '42 27:49
Morgan, Alfred An Acquarium Book for Boys and Girls. '36 22:101
Phleger, Fred Red Tag Comes Back. '61 48:200
Podendorf, Illa The True Book of Animals of the Sea and Shore. '56 41:367
Porter, Walter P. and Hansen, Einar A. The Pond Book. '36 22:275
Selsam, Millicent and Morrow, Betty See Through the Sea. '55 43:375-76
Street, Philip Between the Tides. '53 38:245
Wells, Harrington Seashore Life. '37 22:163
Zim, Herbert S. The Great Whales. '51 36:199-200
Zim, Herbert S. and Ingle, Lester Seashores. '55 40:244
Zim, Herbert S. and Shoemaker, Hurst S. Fishes. '56 41:343

f. Zoology — Aquatic Animals (Books for Adults)

Abbott, R. Tucker How to Know the American Marine Shells. 52:80
Borgeson, Griffith and Lillian Home Aquarium Handbook. '57 41:344
Brown, Alison Leadley Ecology of Fresh Water. '71 56:282-83
Brown, E. S. Life in Fresh Water. '56 41:344
Coates, Christopher W. Tropical Fishes as Pets. '33 18:197
Cousteau, Jacques-Yves and Diole, Philippe Life and Death in a Coral Sea. '71 57:89-90
Curtis, Brian The Life Story of the Fish. '38 24:358
Firth, Frank E. The Encyclopedia of Marine Resources. 54:392
Godfrey, Joe, Jr. Fresh Water Fish: Salt Water Fish. 33:304
Johnson, Myrtle E. and Snook, Harry J. Sea Shore Animals of the Pacific Coast. 12:493
McClintock, Theodore The Under Water Zoo. '38 23:57
Mellanby, Helen and Eastham, L. E. S. Animal Life in Fresh Water. '38 24:236
National Geographic Society (Edited by LaGorce, John Oliver) The Book of Fishes. '39 25:410
Nichols, John T. and Bartsch, Paul Fishes and Shells of the Pacific World. '45 20:246
Perry, Louise M. and Schwengel, Jeanne S. Shells of the West Coast of Florida. '55 41:250-51
Richards, Horace G. Animals of the Seashore. '38 23:355
Smith, B. Webster The World Under the Sea. '40 25:178
Verrill, A. Hyatt Wonder Creatures of the Sea. '40 25:178

g. Zoology — Birds (Books for Children)

Allen, Arthur A. The Golden Plover and Other Birds. '39 23:231
Ashbrook, Frank G. The Blue Book of Birds of America; The Red Book of Birds of America; The Green Book of Birds of America. '31 18:126
Ashbrook, Frank G. The Blue Book of Birds of North America. The Green Book of Birds of North America. The Red Book of Birds of America. The Yellow Book of Birds of America. '46 33:304
Bayne, C. S. Getting to Know the Birds. '44 30:54
Beecher, W. J. A Child's Book of Birds. '68 52:511
Boulton, Rudyerd Traveling with the Birds. '33 20:187; 31:116
Coevering, Jack Van Real Boys and Girls Go Birding. '39 24:180
Crosby, Alexander L. Canada Geese. '66 51:104
Darling, Louis Penguins. '56 41:363
Dilger, William C. Finding Out About Birds. '67 52:505
Earle, Olive L. Birds and Their Nests. '52 37:276
Earle, Olive L. Birds of the Crow Family. 52:95
Earle, Olive L. Robins in the Nest. '53 37:292
Earle, Olive L. The Swans of Willow Pond. '55 41:362
Evans, Edna H. Bill and the Bird Bander. '40 26:111; 27:44
Fenton, Carroll Lane and Pallas, Dorothy Constance Birds and Their World. '54 39:87
Friskey, Margaret Birds We Know. '54 39:77
Garelick, May What's Inside? '55 43: 281
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Hiser, Iona Seibert From Scales to Fancy Feathers. 52:91-92
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Ripper, Charles L. Diving Birds. '67 52:95-96
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Sears, Paul McCutcheon Barn Swallow. '55 41:352
Selsam, Millicent E. Egg to Chicks. '46 31:116
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Verrill, A. Hyatt Strange Birds and Their Stories. '38 23:355
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Byers, Emma F. Out of Doors with Birds. 24:358
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Dubkin, Leonard The Murmur of Wings. '44 30:246
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Adrian, Mary Gray Squirrel. '55 43:376-77
Ashbrook, Frank G. Furry Friends. '30 20:231
Barry, Robert Animals Around the World. '67 52:79-80
Berrill, Jacquelyn Wonders of the Monkey World. '67 52:91
Breeden, Stanley and Kay The Life of the Kangaroo. '67 51:406
Bronson, Wilfrid S. The Chisel-Tooth Tribe. '39 24:179
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Brown, Margaret Wise Young Kangaroo. '55 43:280
Burns, William A. Horses and Their Ancestors. '54 41:347
Davis, George An Animal Tour. '46 31:107
Davis, Joseph A. Finding Out About Mammals. '67 52:505-06
Earle, Olive L. Camels and Llamas. '61 52:95
Earle, Olive L. Mice at Home and Afield. '57 41:362
Goudey, Alice E. Here Come the Bears. '54 39:88
Goudey, Alice E. Here Come the Deer. '55 43:278
Hogner, Dorothy The Cat Family. '56 43:84
Hornblow, Leonora and Arthur Animals Do the Strangest Things. '64 49:498
Hoyt, Vance Joseph Zorra: The Biography of a Gray Fox. '33 21:49
Humphreys, Dena The Big Book of Animals. 39:85
Kelway, Phyllis The Otter Book. '45 31:116
Kelway, Phyllis The Squirrel Book. '44 31:115
Lauber, Patricia The Story of Dogs. '66 51:104
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Mason, George F. The Deer Family. '62 52:93
McClung, Robert M. Major: The Story of a Black Bear. '56 41:363-64
Neurath, Marie The Wonder World of Animals. 38:115
Perkins, Marlin Zooparade. '54 41:351-52
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Wells, Eric F. V. Lions--Wild and Friendly. '34 18:280
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Bibby, Cyril How Life Is Handed On. '47 34:275
Butterfield, Frances W. From Little Acorns: The Story of Your Body. '51 37:148
Cheesman, Evelyn The Growth of Living Things. '32 17:260; 17:347
Eisenberg, Philip and Miriam The Brave Gives Blood. '54 39:76
Froman, Robert The Many Human Senses. '66 51:414
Gamow, George Mr. Tompkins Learns the Facts of Life. '54 39:244
Gilbert, Margaret Shea Biography of the Unborn. '38 23:294
Boldin, Augusta Straight Hair, Curly Hair. '66 52:102
Gruenberg, Sidonie M. The Wonderful Story of How You Were Born. '52 37:290
Guttmacher, Alan Frank Life in the Making. '33 18:198
Novikoff, Alex From Head to Foot, Our Bodies and How They Work. '46 32: 221-22
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Asimov, Isaac The Human Brain. '65 52:514
Boos, William F. The Poison Trail. '40 25:291
Boyd, William An Introduction to Medical Science. '37 21:259
Causey, David Uninvited Guests. '32 16:432
Dent, John Yerbury The Human Machine. '37 21:219
Donnison, C. P. Civilization and Disease. '38 24:55
Erb, Russel C. The Common Scents of Smell. '68 52:512
Estabrooks, G. H. Man, the Mechanical Misfit. '41 26:56
Fishbein, Morris Frontiers of Medicine. '33 19:43
Geldard, Frank A. The Human Senses. '53 39:253
Harrison, R. J. The Child Unborn. '51 38:325
Henderson, Yandell Adventures in Respiration. Modes of Asphyxiation and Methods of Resuscitation. '38 23:294
Hill, Charles A Manual of Normal Histology and Organography. '37 21:124
Hoerr, Normond L. and Osol, Arthur (Editors) Blakiston's Illustrated Pocket Medical Dictionary. '52 38:316
Hoskins, R. G. The Tides of Life. '33 21:259
Kermack, W. O. and Eggleton, P. The Stuff We're Made Of. '38 24:236
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Moncrief, R. W. The Chemical Senses. '46 31:38
Potter, Edith L. Fundamentals of Human Reproduction. '48 33:85
Reidman, Sarah R. Your Blood and You. '52 38:182
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Wilson, Netta W. and Weisman, S. A. Modern Medicine. '42 27:51
Wright, W. D. The Perception of Light. '39 24:236
Zinsser, Hans Lice and History. '38 23:298

j. Genetics and Heridity (Books for Children)

Auerbach, Charlotte The Science of Genetics. '64 52:508
Boyer, Samuel H., IV. Papers on Human Genetics. 52:515
Cook, Robert C. and Burks, Barbara S. How Heredity Builds Our Lives. '46 30:324
Dunn, L. C. Genetics in the 20th Century. '51 35:302
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Goldstein, Philip Genetics Is Easy. '47 32:225
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McKusick, Victor A. Medical Genetics, 1958-1960. 49:N4
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Osborn, Frederick Preface to Eugenics. '40 25:353-54
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Bloch, Marie Halun Dinosaurs. '55 41:352
Brown, Stanley B. and Brown, Barbara M. The Story of Dinosaurs. '58 44:152
Burnett, R. Will Life Through the Ages. '47 32:120

Clark, Mary Lou The True Book of Dinosaurs. '55 41:350
Darling, Lois and Louis Before and After the Dinosaurs. 52:97
Dickinson, Alice The First Book of Prehistoric Animals. '54 39:73
Ditmars, Raymond L. and Carter, Helene Prehistoric Animals. '34 20:187
Fenton, Carroll Lane Life Long Ago. '37 22:217
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Froman, Robert Billions of Years of You. '67 52:83
Holden, Raymond Famous Fossil Finds. '66 52:91
Johnson, Gaylord How Father Time Changes the Animals' Shapes. '39 27:48
Novikoff, Alex Climbing Our Family Tree. '45 30:179
Robinson, W. W. Beasts of the Tar Pits. '32 17:257
Scheele, William E. The First Mammals. '55 41:344
Verrill, A. Hyatt Strange Prehistoric Animals and Their Stories. '48 32:375
Whitnall, Harold O. A Parade of Ancient Animals. '36 21:171
Wyler, Rose and Ames, Gerald Life on the Earth. '53 38:243
Zim, Herbert S. Dinosaurs. '54 39:70

k. Paleontology and Evolution (Books for Adults)

Andrews, Roy Chapman Meet Your Ancestors. '45 30:99-101
Beutner, R. Life's Beginning on the Earth. '38 23:294
Blum, Harold F. Time's Arrow and Evolution. 52:89
Bradley, John Hodgdon, Jr. Parade of the Living. '30 16:83-84
Cain, A. J. Animal Species and Their Evolution. 52:90
Clark, Austin H. The New Evolution: Zoogenesis. '30 14:660
Colbert, Edward H. The Dinosaur Book. '45 30:249
Fenton, Carroll L. The World of Fossils. '33 19:37
Goldschmidt, Richard The Material Basis of Evolution. '40 24:407
Grimes, Charles W. A Story Outline of Evolution. '45 30:53
Gruenberg, Benjamin C. The Story of Evolution. '29 14:572
Haldane, J. B. S. The Causes of Evolution. 17:253
Hooton, Earnest A. Up from the Ape. '31 16:251-52
Keith, Sir Arthur A New Theory of Human Evolution. '49 34:337
Knight, Charles R. Life Through the Ages. '46 30:165
Leakey, L. S. B. Adam's Ancestors. '35 20:230
Mather, Kirtley F. Sons of the Earth. '30 16:84; 17:77
Morgan, Thomas Hunt The Scientific Basis of Evolution. '32 17:77
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Raymond, Percy A. Prehistoric Life. '39 24:297
Romer, Alfred Sherwood Man and the Vertebrates. '55 41:251
Romer, Alfred S. The Procession of Life. '72 57:243-44
Ross, Herbert H. A Synthesis of Evolutionary Theory. 52:516
Seers, A. Waddingham The Earth and Its Life. 6:569
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Stewart, George R. Man: An Autobiography. '46 31:35
Weidenreich, Franz Apes, Giants, and Man. '46 30:303-04
Wells, H. G., Huxley, Julian S. and Wells, G. P. Evolution, Fact and Theory. '32 17:163
White, M. J. D. Animal Cytology and Evolution. '45 32:55
Willey, Arthur Lectures on Darwinism. '30 16:342

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Jaques, H. E. Living Things How to Know Them. '39 23:395
Schwartz, Julius Through the Magnifying Glass. '54 40:243
Snyder, J. Rossiter Creatures Great and Small. '35 20:188
Webber, Irma E. Anywhere in the World. '47 32:290

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Allee, Warder Clyde Animal Life and Social Growth. '32 16:522
Ball, Eric G. Biochemical Preparations Volume 2. 38:315
Bastock, Margaret Courtship: An Ethological Study. '67 53:175
Bonner, John Tayler Cells and Society. '55 41:245
Bradley, John Hodgdon Patterns of Survival. '38 22:377
Clement, A. G. Living Things. 11:216
Croll, N. A. Ecology of Parasites. '66 52:511
East, Edward M. (Editor) Biology in Human Affairs. '31 16:82-83
Gerard, R. W. Unresting Cells. '40 25:236
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Gray, Peter (Editor) Encyclopedia of the Biological Sciences. '70 55:102
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Hill, A. V. Adventures in Biophysics. '31 15:274
Holmes, S. J. Organic Form and Related Biological Problems. '48 32:224
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Jennings, H. S. The Biological Basis of Human Nature. '30 17:347
Kellogg, W. N. and Kellogg, L. A. The Ape and the Child. '33 19:88
Knobloch, Irving William Readings in Biological Science. '48 32:376
Koppanyi, Theodore The Conquest of Life. '30 15:74
Mainx, Felix Foundations of Biology. '55 40:163
Malisoff, William M. Dictionary of Biochemistry and Related Subjects. '43 28:296
Needham, Joseph Order and Life. '68 53:179
Pearl, Raymond The Natural History of Population. '39 23:229-30
Putnam, H. D. Eutrophication in North Central Florida Lakes. '69 55:100
Sheard, Charles Life-Giving Light. '33 17:344
Steen, Edwin B. Dictionary of Biology. '71 57:106-07
Thomson, J. A. Everyday Biology. 9:67
Thomson, Sir J. Arthur Biology for Every Man. '35 20:184
Tolansky, S. Optical Illusions. '67 53:181
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Watson-Baker, W. World Beneath the Microscope. '35 20:187

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Blough, Glenn O. Lookout for the Forest. '55 40:242-43
Blough, Glenn O. The Tree on the Road to Turntown. '53 37:268
Bruere, Martha Bensley Your Forests. '45 30:108
Curtis, Mary I. Conservation in America. '47 33:310
Evers, Alf The Treasure of Watchdog Mountain. '55 43:377
Hazen, Barbara Please Protect the Porcupine. '67 52:84
Johnson, James Ralph The Last Passenger. '56 43:377-78
Lathrop, Dorothy P. Let Them Live. '51 37:292
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Shuttlesworth, Dorothy E. The Wildlife of South America. '66 52:99
Smith, F. C. The First Book of Conservation. '54 39:73; 43:287
Tchaika, Florence Trouble at Beaver Dam. '53 39:76
Webber, Irma E. Thanks to Trees. '52 37:277
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Baer, Marian E. Pandora's Box. The Story of Conservation. '39 24:180
Beard, Daniel Fading Trails. '42 27:49-50
Caldwell, Lynton Keith Environment, A Challenge to Modern Society. '70 56:569

Callison, Charles H. (Editor) America's Natural Resources. '67 52:517
Carskadon, Thomas R. and Modley, Rudolf U.S.A.: Measure of a Nation. '49 33:314
Chase, Stuart Rich Land, Poor Land. '36 21:167
Cocannouer, Joseph A. Tramping Out the Vintage. '45 30:162
Dewhurst, J. Frederick and Associates America's Needs and Resources. '47 33:72-76
Fanning, Leonard M. Our Oil Resources. '45 30:312
Faulkner, Edward H. A Second Look. '47 33:166
Fitzpatrick, Frederick L. The Control of Organisms. '40 25:175
Flawn, Peter T. Environmental Geology: Conservation, Land-Use Planning, and Resource Management. '70 56:567-68
Frasier, Dean The People Problem. '71 57:104
Fuchs, Walter M. When the Oil Wells Run Dry. '46 32:52
Gabrielson, Ira N. Wildlife Conservation. 52:514
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Gaer, Joseph Men and Trees. '39 25: 173
Gifford, John C. Living by the Land. '45 30:305-06
Glover, Katherine America Begins Again. '39 23:293-94
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Hazard, Joseph T. Our Living Forests. '48 33:79
Martin, Alexander C. Botany and Our Social Economy. '48 32:293
Mather, Kirtley F. Enough and to Spare. '44 29:219
McCluney, William Ross (Editor) What You Can Do to Stop the Environmental Destruction of South Florida. '71 56:576-78
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Murdoch, W. W. Environment, Resources, Pollution, and Society. '71 56: 579-82
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Osborn, F. This Plundered Planet. '48 33:166
Parkins, A. E. and Whitaker, J. R. (Editors) Our Natural Resources and Their Conservation. '36 21:54
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Pearson, Frank A. and Harper, Floyd A. The World's Hunger. '45 33:166
Perry, John Our Polluted World: Can Man Survive? '67 55:259
Pfeiffer, Ehrenfried The Earth's Face and Human Destiny. '47 33:166
Popkin, Roy The Environmental Science Services Administration. '67 53:179
Pryor, William Clayton and Pryor, Helen S. Water--Wealth or Waste. '39 24:413
Reed, W. Maxwell America's Treasure. '39 24:413
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Russell, Sir E. J. Lessons on Soil. '50 34:329
Sears, Paul B. Deserts on the March. '35 22:209
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Smith, Guy Harold (Editor) Conservation of the Natural Resources. '50 34: 340-41
Strobbe, Maurice A. Understanding Environmental Pollution. '71 56:578
Sutman, Francis X. (Editor) What Kind of Environment Will Our Children Have? '71 56:574-75
Troost, Cornelius J. and Altman, Harold Environmental Education: A Sourcebook. '72 57:108
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Vogt, W. Road to Survival. '48 33: 166
Whitaker, Joe Russell The Life and Death of the Land. '46 33:76-77
Wing, Leonard W. Practice of Wildlife Conservation. '65 51:417
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Zimmerman, O. T. and Lavine, Irwin DDT, Killer of Killers. '46 31:41
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Andrews, Roy Chapman This Amazing Planet. '40 25:235

Athey, Lillian Cox Along Nature's Trails. '36 21:115
Bell, Thelma Harrington and Bell, Corydon Nature Paint Book. '33 21:115
Berrill, Jacquelyn Wonders of the Woodland Animals. '53 38:109
Blough, Glenn O. Soon After September. '59 49:96
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Butler, Mary C. Happy Nature Adventurers. '37 22:217
Carr, William H. The Stir of Nature. '30 17:166
Doane, Pelagie A Book of Nature. '52 38:107-08
Epple, Anne Orth Nature Quiz Book. '54 41:352
Fenton, Carroll Lane Wild Folk at the Pond. '48 32:378-79
Fox, Charles Philip When Spring Comes. '64 49:BC
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Fuller, Raymond T. Along the Brook. '31 18:125
Furbay, John Harvey Curious Habits of Our Common Birds, Animals, and Plants. '35 20:182
Gaul, Albro The Pond Book. '55 44:64
Goetz, Delia Grasslands. 52:97
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Huntington, Harriet E. Let's Go Outdoors. '39 24:180
Hylander, C. J. Out of Doors in Spring. '42 27:49
Hylander, Clarence J. The Year Round. '32 18:126
Kane, Henry B. The Tale of the Wild Goose; The Tale of the Bullfrog. '46 31:108
Kenly, Julie Closson Children of a Star. '32 17:259
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Lubell, Winifred and Cecil In a Running Brook. '68 52:507
Mann, Paul B. and Hastings, George T. Out of Doors. '32 17:247
Mitchell, Lucy Sprague Guess What's in the Grass. '45 30:180
Parker, Bertha Morris Spring Is Here; Summer Is Here; Fall Is Here; Winter Is Here. '48 33:303
Patch, Edith M. Holiday Hill. '31 16:433-34
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Patch, Edith M. and Fenton, Carroll L. Desert Neighbors. '37 22:329
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Peattie, Donald Culross The Rainbow Book of Nature. '57 41:368
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Werner, Jane and the Staff of the Walt Disney Studio Walt Disney's Living Desert. '54 41:357
Werner, Jane and the Staff of the Walt Disney Studio Walt Disney's Vanishing Prairie. '55 41:357
True Nature Series Animals of the Woods; Gray Squirrel; Snapping Turtle; Water Birds; Black Bear Twins; Three Little Kittens; Pride, the Saddle Hourse; Shep, the Farm Dog; Goats and Kids; Bunny Rabbit; Animals on the Farm; and Elephants. '46 31:106

n. Nature Study and Natural History (Books for Adults)

Clark, Austin H. Nature Narratives. '31 16:333
Devoe, Alan Down to Earth. '40 25:176
Fisher, G. Clyde (Editor) Nature's Secrets. 21:211
Fuller, Raymond T. The Doorway to Nature. '31 18:188
Furbay, John Harvey Nature Chats--A Year Out-of-Doors. '34 19:137
Hawkes, Clarence Notes of a Naturalist. '38 23:57
Jordan, E. L. Hammond's Nature Atlas of America. '52 38:102-03
McCreery, James L. Exploring the Earth and Its Life in a Natural History Museum. '33 18:258
Medsger, Oliver P. Nature Rambles: Summer; Nature Rambles: Autumn. '32 17:166
Medsger, Oliver Perry Nature Rambles. Spring. '32 21:115

Palmer, E. Laurence Fieldbook of Natural History. '49 33:309
Peterson, Roger Tory Wildlife in Color. '51 38:107
Pimental, Richard A. Natural History. '63 52:518
Royston, H. R. The Unity of Life. 12: 354
Thomson, Sir J. Arthur The Outline of Natural History. '31 16:431
Watson, E. L. Grant Mysteries of Natural History. '36 23:355
Woods, Robert S. The Naturalist's Lexicon. '44 30:101

o. Agriculture, Domestic Science, and Forestry (Books for Children)

Buehr, Walter The Magic of Paper. '66 52:96
Chamberlain, James F. How We Are Clothed. 8:375
Darling, Louis Chickens and How to Raise Them. '55 41:363
Duncan, Marion On the Farm. '40 25:171
Gringhuis, Dirk Of Cabbages and Cattle. '62 51:415
Hollos, Clara The Story of Your Bread. '49 33:305
Perry, Josephine Fish Production. '40 25:175
Perry, Josephine The Paper Industry. '46 30:254
Perry, Josephine and Slauson, Cleste Forestry and Lumbering. '39 24:413
Petersham, Maud and Miska The Story Book of Clothes. '33 21:117
Petersham, Maud and Miska The Story Book of Things We Hear. '39 24:178
Rogers, Matilla The First Book of Cotton. '54 39:74
Schloat, G. Warren, Jr. The Wonderful Egg. '52 37:272
Wall, Gertrude Wallace Gifts from the Forest. '52 39:176
Winchell, Florence Food Facts for Every Day. 9:280
Zim, Herbert S. Your Food and You. '57 41:361

o. Agriculture, Domestic Science, and Forestry (Books for Adults)

Bendure, Zelma and Pfeiffer, Gladys America's Fabrics. '46 30:319
Blumenthal, Saul Food Products. '47 32:52
Brunner, Edmund de S., Sanders, Irwin T. and Ensminger, Douglas Farmers of the World: The Development of Agricultural Extension. '45 30:109
Clark, William H. Farms and Farmers. '45 30:109-10
Eberle, Irmengarde Basketful: The Story of Our Foods. '46 30:307-08
Ellis, Rhoda Dictionary of Dietetics. '56 42:95
Furnas, C. C. and Furnas, S. M. Man, Bread and Destiny. '37 22:375
Fraser, Samuel American Fruits. '27 12:567
Harrow, Benjamin Vitamines. 6:344
Hinman, Robert B. and Harris, Robert B. The Story of Meat. '39 25:355
Hutchinson, J. B., Silow, R. A. and Stephens, S. G. The Evolution of Gossypium and the Differentiation of the Cultivated Cottons. '47 32:225-26
Johnson, Sherman E. and Associates Managing a Farm. '46 30:306
Kellogg, Charles E. The Soils that Support Us. '41 26:56
Lampert, L. M. Milk and Dairy Products. '47 32:225
Leggett, Wm. F. The Story of Linen. '45 30:54
Leggett, William F. The Story of Wool. '47 32:57
McCance, R. A. and Widdowson, E. M. The Chemical Composition of Foods. '47 32:51-52
Phillips, A. J. Gardening Without Soil. '40 25:57
Rosewarne, D. D. The Science of Nutrition Simplified. '29 14:470
Russell, James E. Heredity in Dairy Cattle. '44 29:217
Sherman, Henry C. Chemistry of Food and Nutrition. '32 16:523-24
Sherman, Henry C. Food and Health. '34 21:55
Sherman, Henry C. Food Products. '35 21:55
Shinkle, John H. Textile Testing. '40 25:294
Strong, John H. Fabric Structure. '47 32:52
Tressler, Donald K. Marine Products of Commerce. 3:533
Worthen, Edmund L. Farm Soils: Their Management and Fertilization. '48 33:80
Zon, Raphael Forests and Water in the Light of Scientific Investigation. 12:568

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Proceedings of the Auburn Conference on the Use of Radioactive Isotopes in Agricultural Research. '48 34:206

2. Physical Sciences and Applications

Note: Listings in each of the following categories are divided into: (1) Books for Children
(2) Books for Adults

a. General Physical Science (Books for Children)

Bendick, Jeanne How Much and How Many. '47 37:145

Bragdon, Lillian J. Tell Me the Time, Please. '36 21:51

David, Eugene Crystal Magic. '65 49: 498

Ilin, M. What Time Is It? '32 17:349

Lord, Eugene Hodgdon Experimenting at Home with the Wonders of Science. '40 25:170-71

Schlein, Miriam It's About Time. '55 43:281

Watson, Jane Werner How to Tell Time. '57 41:354

Ziner, Feenie and Thompson, Elizabeth The True Book of Time. '56 41:368

a. General Physical Science (Books for Adults)

Adler, Irving The Secret of Light. '52 39:176

Bennett, H. Standard Chemical and Technical Dictionary. '39 24:298

Childs, W. H. J. Physical Constants. '34 18:188

Collins, A. Frederick Science for Young Men. '46 30:245

DeMent, Jack and Dake, H. C. Uranium and Atomic Power. '45 32:45-46

Frank, J. O. and White, H. K. High School Science Terminology; Chemistry and Physics. '30 14:576

Freeman, Ira M. Invitation to Experiment. '40 25:171

Graydon, Thomas H. New Laws for Natural Phenomena. '38 22:377

Hodgman and Lange Handbook of Physics and Chemistry. 10:432

Hodgman and Lange Handbook of Chemistry and Physics. 12:494

Hodgman, Charles D. Handbook of Chemistry and Physics. '32 17:162

Hodgman, Charles D. Handbook of Chemistry and Physics. '54 39:249

Kahn, Fritz Design of the Universe: The Heavens and the Earth. '54 41:172

Jauncey, G. E. M. and Langsdorf, A. S. M.K.S. Units and Dimensions. '40 25:291

Luckiesh, M. Foundations of the Universe. '25 12:566

Millikan, R. A., Merriam, John C., Shapley, Harlow and Breasted, James H. Time and Its Mysteries. '36 22:101

Palmer, Brooks The Romance of Time. '54 41:442

Panth, Bhola D. Consider the Calendar. '44 29:217

Richardson, E. G. Physical Science in Art and Industry. '41 25:412

Richardson, E. G. Physical Science in Modern Life. '39 23:356

Roller, Duane The Terminology of Physical Science. '29 14:468

Shapley, Harlow, Wright, Helen and Rapport, Samuel (Editors) Readings in the Physical Sciences. '48 34: 330

Ward, A. G. The Nature of Crystals. '39 25:120

Wilson, P. W. The Romance of the Calendar. '37 21:167

Time and Its Mysteries, Series III. '49 34:339

b. Physical Science — Atomics and Structure of Matter (Books for Children)

Beeler, Nelson F. and Branley, Franklyn M. Experiments with Atomics. '54 39:80

Gamow, George Mr. Tompkins Explores the Atom. '44 28:296

Leeds, Roslyn D. Introducing the Atom. '67 52:508-09

Lewellen, John You and Atomic Energy and Its Wonderful Uses. '49 33: 304

b. Physical Science — Atomics and Structure of Matter (Books for Adults)

Anderson, William R. The Useful Atom. '66 52:512
Bohr, Niels Atomic Theory and the Description of Nature. '34 19:80
Bova, Ben The Fourth State of Matter: Plasma Dynamics and Tomorrow's Technology. '71 56:582-83
Briscoe, Herman T. The Structure and Properties of Matter. '35 19:197-98
Buckingham, John Matter and Radiation. '30
Conn, G. K. T. The Nature of the Atom and the Wave Nature of the Electron. '39 25:58
Crehore, Albert Cushing Electrons, Atoms, Molecules. '46 31:40
Darwin, C. G. The New Conceptions of Matter. '31 16:435-36
Darrow, Karl K. Atomic Energy. '48 34:332
Davis, Helen Miles (Editor) Atomic Facts. '50 37:350
Fearnside, K., Jones, E. W. and Shaw, E. N. Applied Atomic Energy. '54 39:255
Eidinoff, Maxwell Leigh and Ruchlis, Hyman Atomics for the Millions. '47 31:331
Frisch, O. R. Meet the Atoms. '47 31: 333
Glasstone, Samuel Sourcebook on Atomic Energy. '67 52:(1)BC
Haas, Arthur The World of Atoms. '37 22:217
Heisenberg, W. Nuclear Physics. '53 38:323
Hochstrasser, Robin M. Behavior of Electrons in Atoms. '64 52:515
Langdon-Davies, John Inside the Atom. '33 18:255
Mandelker, Jacob Matter, Energy and Mechanics. '54 39:247
Millikan, Robert A. Electrons (+ and -): Protons, Photons, Neutrons, Mesotrons, and Cosmic Rays. '47 31:332
Parker, Bertha Morris Matter and Molecules. '47 32:288
Peacocke, T. A. H. Atomic and Nuclear Chemistry, Volume 1. Atomic Theory and Structure of the Atom. '68 53: 179
Potter, Robert D. Young People's Book of Atomic Energy. '46 31:112
Soddy, Frederick The Interpretation of the Atom. '32 17:249
Shannon, James I. The Amazing Electron. '46 33:80
Solomon, Arthur K. Why Smash Atoms? '40 25:292
Solomon, Arthur K. Why Smash Atoms? '46 30:164
Stout, Wesley W. Secret. '47 34:332
United States Atomic Energy Commission Major Activities in the Atomic Energy Programs. '56 41:440
Wilson, H. A. The Mysteries of the Atom. '34 18:190
Wilson, William The Microphysical World. '54 40:163
Nuclear Terms: A Brief Glossary. '67 52:519

c. Physical Science — Water (Books for Children)

Baer, Marian E. The Wonders of Water. '39 23:398
Clymer, Eleanor Make Way for Water. '53 39:77
Edelstadt, Vera Oceans in the Sky. '46 31:119
Norling, Jo and Ernest The First Book of Water. '52 38:114
Pigman, Augustus A Story of Water. '38 23:113
Riedman, Sarah R. Water for People. '52 37:72
Walsh, Mary Water, Water Everywhere. '53 38:110

c. Physical Science — Water (Books for Adults)

Briggs, Peter Water: The Vital Essence. '67 53:176
Davis, Kenneth S. and Day, John Arthur Water: The Mirror of Science. 52:101
Draffin, Jasper Owen The Story of Man's Quest for Water. '39 23:352
Garnett, William A Little Book on Water Supply. 7:71
King, Thomson Water. '53 37:274
The President's Water Resources Policy Commission. Vol. 1: A Water Policy for the American People; Vol. 2: Ten Rivers in America's Future. '51 35: 231

Woodbury, David O. Fresh Water from Salty Seas. '67 52:508

d. Chemistry and Chemical Industries (Books for Children)

Baker, R. Ray So That's Chemistry. '40 25:172
Beeler, Nelson and Branley, Franklyn Experiments in Chemistry. '52 37:281
Buehr, Walter Plastics: The Man-Made Miracle. '67 52:96
Freeman, Mae and Ira Fun with Chemistry. '44 30:107
Horning, John L. and McGinnis, George C. An Open Door to Chemistry. '46 30: 245-46
Morgan, Alfred First Chemical Book for Boys and Girls. '50 35:58
Morgan, Alfred Things a Boy Can Do With Chemistry. '40 25:178
Morgan, Alfred Things a Boy Can Do With Electrochemistry. '40 25:412
Petersham, Maud and Miska The Story Book of Iron and Steel. '35 21:117
Stone, A. Harris The Chemistry of a Lemon. '66 51:414
Straus, Jacqueline Harris Let's Experiment: Chemistry for Boys and Girls. '62 52:85

d. Chemistry and Chemical Industries (Books for Adults)

Alico, John Introduction to Magnesium and Its Alloys. '45 30:53
Anonymous The Detection and Identification of War Gases. Notes for the Use of Gas Identification Officers. '40 25:60
Anonymous Gasoline by Synthesis. '48 32:376
Anonymous Glyco Cosmetic Manual. '38 22:374
Anonymous Medical Manual of Chemical Warfare. '41 27:43
Amis, Edward S. Kinetics of Chemical Change in Solution. '49 34:206
Armstrong, E. F. and Miall, L. M. Raw Materials from the Sea. '46 32:57
Baker, A. J., Cairns, T., Eglinton, G. and Preston, F. J. More Spectroscopic Problems in Organic Chemistry. '67 52:520
Bebie, Jules Manual of Explosives, Military Pyrotechnics and Chemical Warfare Agents. '43 28:183
Bennett, H. (Editor) The Chemical Formulary. '33 21:54
Bennett, H. (Editor-in-Chief) The Chemical Formulary. '39 23:295
Bennett, H. The Chemical Formulary. '41 26:111
Bennett, H. The Chemical Formulary. '45 30:105-06
Bennett, H. The Chemical Formulary. '48 32:377
Bennett, H. Chemical Specialties. '46 32:52
Bennett, H. Concise Chemical and Technical Dictionary. '47 32:52
Bennett, H. Practical Everyday Chemistry. '34 20:184
Bunzell, H. H. and Nisenson, Samuel Everyday Chemistry. '37 22:327
Chen, Philip S. A New Handbook of Chemistry. '75 60:426
Chilton, Thomas H. Strong Water. '68 53:176
Clarke, Beverly L. Marvels of Modern Chemistry. '32 17:349
Collins, A. Frederick How to Understand Chemistry. '32 18:55
Collins, A. Frederick The March of Chemistry. '36 22:49
Collins, A. Frederick The Metals. '32 17:349
Davis, Helen Miles The Chemical Elements. '52 38:328
Day, Allan R. Electronic Mechanisms of Organic Reactions. '50 34:328
Duck, Edward W. Plastics and Rubbers. '71 56:436
Ehrenfeld, Louis The Story of Common Things. '32 17:249
Epstein, Sam and Beryl The First Book of Glass. '55 43:280
Faraday, Joseph E. Encyclopedia of Hydrocarbon Compounds, Vol. I: C1 to C5. '46 30:252
Findlay, Alexander Chemistry in the Service of Man. '39 25:116
Fisher, Harry L. Rubber and Its Use. '41 26:57
Freeman, Ira M. All About the Wonders of Chemistry. '54 41:360
Glasstone, Samuel Chemistry in Daily Life. '28 14:386
Glasstone, Samuel Recent Advances in General Chemistry. '36 21:221
Glasstone, Samuel Recent Discoveries in Physical Chemistry. '31 17:80
Hackh, Ingo D. W. A Chemical Dictionary. '29 14:468
Hackh, Ingo D. W. Structure Symbols of Organic Compounds. '31 16:254-55

Harry, Ralph G. Modern Cosmetology. '40 24:414
Hausner, Henry H. Powder Metallurgy. '47 32:52
Haynes, William Cellulose: The Chemical that Grows. 38:318
Haynes, William The Stone that Burns. '42 27:50
Hershey, J. Willard The Book of Diamonds. '40 24:414
Hessel, F. A., Martin, W. J. and Hessel, M. S. Chemistry in Warfare. '40 25:116
Hill, Terrell L. Lectures on Matter and Equilibrium. '67 52:515
Hodgman, Charles D. Chemical Tables from the Handbook of Chemistry and Physics. '38 23:298
Holmes, Harry N. Out of the Test Tube. '41 26:55
Holmes, Harry N. Out of the Test Tube. '34 19:139
Howe and Turner Chemistry and the Home. '27 15:276
Hume-Rothery, William Electrons, Atoms, Metals, and Alloys. '55 40:163
Hyman, Herbert H. Noble-Gas Compounds. '63 52:517-18
Jacobs, Morris J. The Chemical Analysis of Foods and Food Products. '38 22: 374
John, W. D. Modern Polishes and Specialties. '47 32:45
Joralemon, Ira B. Romantic Copper, Its Lure and Lore. '34 19:198-99
Kharsch, M. S. and Reinmuth, Otto Grignard Reactions of Non-Metallic Substances. '54 39:249
Kolthoff, I. M. Acid Base Indicators. '37 22:102
Latimer, Wendell M. and Hildebrand, Joel H. Reference Book of Inorganic Chemistry. '51 36:311
Latimer, W. M. and Hildebrand, J. H. Reference Book of Inorganic Chemistry. '40 25:296-97
Long, Herta R. Alpha ray-Beta ray Emission Chart. '50 35:58
Luder, W. F. and Zuffanti, Saverio The Electronic Theory of Acids and Bases. '46 31:39
Mantell, C. L. Sparks from the Electrode. '33 17:344
Mayer, A. W. Chemical Technical Dictionary. '43 28:183
McMillen, Wheeler New Riches from the Soil. '46 32:59
Meade, Richard K. Portland Cement. '39 25:293
The Merck Index of Chemicals and Drugs. '52 36:311
Mersereau, Samuel Foster Materials of Industry. '41 27:43
Metcalfe, June Aluminum from Mine to Sky. '47 36:62
Metcalfe, June M. Copper, the Red Metal. '44 30:55
Noyes, William Albert and Noyes, W. Albert Modern Alchemy. '32 21:51
Pearl, Richard M. The Wonder World of Metals. '66 52:508
Perry, Josephine The Chemical Industry, The Glass Industry, The Electrical Industry, Fish Production, The Coal Industry, The Cotton Industry, The Steel Industry, Forestry and Lumbering, and Milk Production. '40-45 30:107
Perry, Josephine The Light Metals Industry. '47 32:49
Perry, Josephine The Petroleum Industry. '46 30:253
Perry, Josephine The Plastics Industry. '47 32:48-49
Perry, Josephine The Rubber Industry. '46 32:49
Porter, Harold M. Chemistry of Foods and Household Materials. '37 22: 334
Read, William Thornton Industrial Chemistry. '33 20:117
Rivett, A. C. D. The Phase Rule. 8: 531
Rogers, Frances and Beard, Alice 5000 Years of Glass. '37 22:375
Sabel, William Basic Techniques of Preparative Organic Chemistry. '67 53:180
Sand, Henry S. Electrochemical Theory. '39 25:59
Slack, A. V. Defense Against Famine: The Role of Fertilizer Industry. '70 55:586
Slosson, Edwin E. Creative Chemistry. 5:185
Snell, Foster Dee and Snell, Cornelia T. Chemicals of Commerce. '39 24:298
Swezey, Kenneth M. Chemistry Magic. '56 41:239
Sykes, Peter A Guidebook to Mechanism in Organic Chemistry. '70 57:100
Symposium: The Chemical Industry Facts Book. '55 41:250
Symposium: The Home Chemist. '34 21: 54
Wachtel, Curt Chemical Warfare. '41 27:43
Wahl, Arthur C. and Bonner, Norman A. Radioactivity Applied to Chemistry. '51 36:61
Weingart, George W. Pyrotechny. '39 25:294
Williams, Trevor Illtyd The Elements of Chromatography. 40:163
Wolfe, Bernard Plastics. '45 30:106

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e. General Physics (includes mechanics, energy and heat, light, sound and applications) (Books for Children)

Baer, Marian E. Sound. '52 37:276
Branley, Franklyn M. and Vaughn, Eleanor K. Mickey's Magnets. '56 43:83
Feravolo, Rocco V. Light. '61 51:414
Fischer, Vera Kistiakowsky One Way Is Down. '67 52:100
Hawks, Ellison The Romance of the Merchant Ship. '31 17:259
Ilin, M. How the Automobile Learned to Run. '45 30:179
Kettelkamp, Larry The Magic of Sound. '56 41:365
Kettlekamp, Larry Shadows. '57 41:365
Lewellen, John The True Book of Toys at Work. '53 39:76
Lineaweaver, Marion The First Book of Sailing. '53 39:74
McCullough, John G. and Kessler, Leonard Farther and Faster. '54 39:80
Nelson, Lee All the Sounds We Hear. '60 50:192
Petersham, Maud and Miska The Story Book of Wheels. '35 21:117
Pine, Tillie S. and Levine, Joseph Friction all Around. '60 49:80
Schneider, Herman and Nina Let's Look Inside Your House. '48 32:378
Schneider, Herman and Nina Now Try This. '47 32:290
Stone, A. Harris and Siegel, Bertram M. Take a Balloon. '67 52:99
Tresselt, Alvin How Far Is Far? '64 52:506
Van Metre, T. W. Trains, Tracks, and Travel. '46 30:321
Zim, Herbert S. Things Around the House. '54 39:70
Zim, Herbert S. What's Inside of Engines? '53 37:291

e. General Physics (includes mechanics, energy and heat, light, sound and applications) (Books for Adults)

Anderson, Rudolph E. The Story of the American Automobile. '50 34:340
Angrist, Stanley W. and Hepler, Loren G. Order and Chaos: Laws of Energy and Entropy. '67 52:516
Bock, George E. What Makes the Wheels Go Around. '31 17:258
Bragg, Sir William The Universe of Light. '33 17:346
Clark, W. M. Manual of Mechanical Movements. '33 17:343
Collins, A. Frederick Experimental Optics. '33 18:255
Collins, A. Frederick Simplified Household Mechanics. '39 25:117
Committee on Colorimetry of the Optical Society of America The Science of Color. '53 38:248
Crouse, William H. Understanding Science. '48 32:375
Culver, Charles A. Musical Accoustics. '56 42:184
Darrow, Floyd L. The New World of Physical Discovery. '30 16:86
Darrow, Karl K. The Renaissance of Physics. '36 21:219
Davis, William S. Practical Amateur Photography. '27 12:567
Donworth, Albert B. Gravitation and the Atomic Bomb. '48 34:206
Dunn, Carleton E. Natural Color Processes. '40 25:238
Edgerton, Harold E. and Killian, James R., Jr. Flash. '39 25:234-35
Evans, Ralph M. An Introduction to Color. '48 32:376
Fleming, J. A. Waves and Ripples. 8: 531
Gabor, D. The Electron Microscope. '48 32:378
Gamow, G. Mr. Tompkins in Wonder Land or Stories of c, G, and h. '40 25: 60
Gamow, George Gravity. 52:101
Halacy, D. S., Jr. Fuel Cells: Power for Tomorrow. '66 52:512
Henney, Keith and Dudley, Beverly Handbook of Photography. '39 25:353
Heyl, Paul R. New Frontiers of Physics. '30 16:85
Hillson, Peter J. Photography: A Study in Versatility. '69 54:391
Hirschlaff, E. Fluorescence and Phosphorescence. '38 23:178
Huey, Edward G. What Makes the Wheels Go Round. '40 24:353
Karlson, Paul The World Around Us. '36 21:124
Kettering, Charles F. and Orth, Allen The New Necessity. '32 16:522
Lewellen, John The Boy Scientist. '55 41:353-54
Loewy, Raymond Locomotive. '37 21:217
Low, A. M. Science for the Home. '38 23:296-97
Luhr, Overton Physics Tells Why. '46 31:332
Luckiesh, Mathew Color and Colors. '38 23:172
Luhr, Overton Physics Tells Why. '43 30:109

Mees, C. E. Kenneth Photography. '37 21:121
Menzel, Donald H. (Editor) Fundamental Formulas of Physics. '55 41:255
Morris, Percy A. Nature Photography Around the Year. '38 23:355
Morwood, John Sailing Acrodynamics. '55 39:183
Mott-Smith, Morton Heat and Its Workings. '33 10:27
Mott-Smith, Morton The Story of Energy. '34 19:38
Mott-Smith, Morton This Mechanical World. '31 16:168
Nehrich, Richard B., Jr., Voran, Glenn I. and Dessell, Norman F. Atomic Light: Lasers--What They Are and How They Work. '68 52:510
Newman, F. H. Recent Advances in Physics (Non-Atomic) '32 16:339
Pye, D. R. Heat and Energy. 8:374
Radley, J. A. and Grant, Julius Fluorescence Analysis in Ultra-Violet Light. '35 20:119
Reck, Franklin M. and Claire Power from Start to Finish. '41 26:112
Richardson, K. I. T. The Gyroscope Applied. '54 40:163
Rothman, Milton A. The Laws of Physics. 52:516-17
Schrodinger, Erwin Space-Time Structure. '50 35:56
Siegbahn, Manne The Spectroscopy of X-Rays. 10:356
Stroddard, Edward The Story of Power. '57 43:283
Symposium: Precision Electrical Measurements. '56 42:94
Wall, E. J. Photographic Emulsions. '29 14:570
Wall, E. J. and Jordan, Franklin I. Photographic Facts and Formulas. '40 25:293
Weiss, Harvey Sailing Small Boats. '67 52:(1)IBC
Young, C. B. F. and Coons, K. W. Surface Active Agents. '45 30:172

f. Physics — Electricity and Applications (Books for Children)

Bendick, Jeanne Electronics for Young People. '47 36:62
Bendick, Jeanne and Robert Television Works Like This. '54 39:72
Baker, Bertha M. The Book of Electricity. '28 13:116
Bragg, W. L. Electricity. '36 22:163
Buehr, Walter Wonder Worker: The Story of Electricity. '61 52:9
Corbett, Scott What Makes a Light Go On? '66 51:414
Epstein, Sam and Beryl The First Book of Electricity. 52:(1)IBC
Epstein, Sam and Beryl The First Book of Electricity. '53 39:73
Gould, Jack All About Radio and Television. 41:359
Meyer, Jerome S. Picture Book of Radio and Television and How They Work. '51 38:115
Morgan, Alfred A First Electrical Book for Boys. '35 20:185
Morgan, Alfred A First Electrical Book for Boys. '51 36:59
Morgan, Alfred First Radio Book for Boys. '41 26:110
Morgan, Alfred Things a Boy Can Do with Electricity. '38 22:379
Podendorf, Illa The True Book of Magnets and Electricity. '61 48:200
Schneider, Herman and Nina Let's Find Out About Electricity. '56 41:346
Schneider, Herman and Nina Your Telephone and How It Works. '52 37:269
Shay, Arthur What Happens When You Make a Telephone Call. '68 52:509
Webster, Hanson H. The World's Messengers. '34 19:89

f. Physics — Electricity and Applications (Books for Adults)

Brown, George H., Hoyler, Cyril N. and Bierwirth, Rudolph A. Theory and Application of Radio-Frequency Heating. '47 32:53
Brown, O. F. The Elements of Radio-Communication. 12:356
Caverly, Don Primer of Electronics and Radiant Energy. '52 38:323
Collins, A. Frederick Fun with Electricity. '36 21:166
Collins, A. Frederick How to Understand Electricity. '35 21:166
Cowan, Lester (Editor) Recording Sound for Motion Pictures. '31 16:341
Crow, Leonard R. Synchros, Self-Synchronous Devices and Electrical Servo-Mechanisms. '53 38:324
Denman, Frank Television, the Magic Window. '52 38:255
Eddy, Capt. Wm. C. Television. '45 30:172
Felix, Edgar H. Television. '31 16: 340-41
Freeman, Samuel Two-Way Radio. '46 30:171

Grimes, David Meet the Electron. '44 29:108
Hale, A. P. Electrical Interference. '56 42:95
Harlow, Alvin F. Old Wires and New Waves. '36 21:221
Hawks, Ellison The Book of Electrical Wonders. '31 16:434
Hylander, C. J. and Harding, R., Jr. An Introduction to Television. '46 30: 250
Ilin, M. Turning Night into Day. The Story of Lighting. '36 22:49
Johnson, J. Richard Television: How It Works. '56 41:443
Krugman, Leonard Fundamentals of Transistors. '54 41:258
Langdon-Davies, John Radio. '35 21:166
Low, A. M. Electronics Everywhere. '52 39:174
Lunt, Joseph R. Everyday Electricity. '27 12:570
MacLaurin, W. Rupert Invention and Innovation in the Radio Industry. '49 34:208
Mark, David Basics of Phototubes and Photocells. '56 41:443
Morgan, Alfred Getting Acquainted with Electricity. '42 27:50
Morgan, Alfred Getting Acquainted with Radio. '40 25:237
Moseley, Sydney A. and McKay, Herbert Television. '36 21:221
Poole, Lynn and Gray Electronics in Medicine. '64 48:434
Rider, John F. Basic Vacuum Tubes and Their Uses. '55 41:256
Samuels, M. M. Power Unleashed. '46 31:37
Sommers, A. Photoelectric Cells. '47 32:52
Squier, George O. Telling the World. '33 17:346
Stokley, James Electrons in Action. '46 30:313
Taylor, Denis Introduction to Radar and Radar Techniques. '67 53:180
Tyler, Kingdon S. Telecasting in Color. '46 32:56-57
Wade, Herbert T. Everyday Electricity. '24 12:568
Woodbury, David O. Communications. '31 16:340
Yates, Raymond F. Fun with Electronics. '45 30:107
Yates, Raymond F. New Television: The Magic Screen. '48 32:376
Yates, Raymond F. These Amazing Electrons. '37 23:232
Yates, Raymond F. The Working Electron. '46 30:304
Young, Victor J. Understanding Microwaves. 41:257

g. Earth Science – Geology, Physical Geography, Mineralogy (Books for Children)

Branley, Franklyn M. North, South, East, and West. '66 52:102
Clark, Mary Lou You and How the World Began. '57 41:368
Cormack, M. B. The First Book of Stones. '50 38:113
Goetz, Della Deserts. '56 41:362
Goetz, Della Mountains. '62 52:95
Hellman, Hal Navigation: Land, Sea, and Sky. '66 52:98
Huntington, Harriet E. Let's Go to the Desert. '49 33:379
Keene, Melvin The Beginner's Story of Rock and Minerals. '66 52:86
Kennamer, Lorrin and Wishart, A. Paul Geography. '62 49:498
McDonald, Lucille Saunders Jewels and Gems. '40 25:238
Pease, Josephine van Dolzen This Is the World. '46 31:108
Pine, Tillie S. and Levine, Joseph Air All Around. 52:80
Podendorf, Illa The True Book of Seasons. '55 41:350
Pough, Frederick H. All About Volcanoes and Earthquakes. 41:360
Russell, Solveig Paulson From Rocks to Rockets. '60 52:92
Schneider, Herman and Nina Follow the Sunset. '52 37:269
Schneider, Herman and Nina Rocks, Rivers, and the Changing Earth. '52 37:269
Shannon, Terry Among the Rocks. 41: 347
Shuttlesworth, Dorthy The Story of Rocks. '56 41:347
Stone, A. Harris and Ingmanson, Dale Rocks and Rills: A Look at Geology. '67 52:98
Townsend, Herbret Our Wonderful Earth. '50 35:57
Washburne, Carleton and Washburne, Hellen The Story of Earth and Sky. '33 19:86
Zim, Herbert S. Waves. '67 52:93
Zim, Herbert S. What's Inside the Earth? '53 39:70

g. Earth Science – Geology, Physical Geography, Mineralogy (Books for Adults)

Abbot, C. G. The Sun's Short Regular Variation and Its Large Effect on Terrestrial Temperatures. '47 33:79
American Geological Institute Dictionary of Geological Terms. 52:220
Atwood, Wallace W. The Physiographic Provinces of North America. '40 25:355
Atwood, Wallace W. The Rocky Mountains. '45 30:104
Baars, Donald L. Red Rock Country: The Geologic History of the Colorado Plateau. '72 57:551-52
Barton, Robert Oceanology Today, Man Explores the Sea. '71 56:276-77
Bascom, Willard Waves and Beaches: The Dynamics of the Ocean Surface. '64 52:521
Battan, Louis J. The Unclean Sky. '66 51:396
Beebe, William Exploring with Beebe. '32 19:43
Beebe, William Nonsuch: Land of Water. '32 17:160
Behrman, Daniel Exploring the Ocean. '70 57:99
Bell, H. S. Oil Shales and Shale Oils. '48 33:82
Bradley, John Hodgdon Autobiography of Earth. '35 20:187
Brindze, Ruth The Gulf Stream. '45 30:103
Burhr, Walter Volcano. 50:2BC
Carlisle, Norman Riches of the Sea. '68 52:510
Cartner, William C. How We Know What on Earth Happened Before Man Arrived. '72 57:242
Casteret, Norbert Ten Years Under the Earth. '38 23:356
Colby, C. B. America's Natural Wonders. '56 44:6
Coleman, Satis N. Volcanoes, New and Old. '46 30:314
Coleman Ice Ages, Recent and Ancient. 11:60
Daly, Reginal Aldworth The Changing World of the Ice Age. '35 22:273
Dobson, C. M. B. The Upper Regions of the Earth's Atmosphere. 12:492
Dodge, Nat N. and Zim, Herbert S. The American Southwest. '55 40:244
Eakle, Arthur S. Mineral Tables. '38 23:354
Ellsworth, Lincoln Exploring Today. '35 20:230
Evans, Eva Knox Why We Live Where We Live. '53 39:180
English, George Letchworth Getting Acquainted with Minerals. '35 20:112
Fenton, Carroll Lane Along the Hill. '35 20:231
Fenton, Carroll Lane and Fenton, Mildred Adams Riches from the Earth. '53 39:180
Fenton, Carroll Lane and Fenton, Mildred Adams The Rock Book. '40 25:236-37
Fisher, James The Wonderful World of the Sea. '57 41:347-48
Fitzhugh, Edward F. Treasures in the Earth. '36 22:325
Flint, Richard Foster Glacial Geology and the Pleistocene Epoch. '47 32:54
Fryxell, Fritiof The Tetons: Interpretations of a Mountain Landscape. '46 30:309
Gait, Robert I. Exploring Minerals and Crystals. '72 58:138
Galt, Tom Volcano. '46 30:313-14
Gamow, George Biography of the Earth. '48 32:376
Gautier, E. F. Sahara, the Great Desert. '35 20:185
Gluck, Nelson The River Jordan. '46 30:308-09
Hamilton, Elizabeth The First Book of Caves. '56 43:282
Hawkins, Alfred C. The Book of Minerals. '35 20:184
Hawks, Ellison The Book of Natural Wonders. '35 20:184
Hood, Peter How the Earth Is Made. '54 39:81
Hotchkiss, William O. The Story of a Billion Years. '33 17:344
Huntington, Harriet E. The Yosemite Story. '66 52:78
Icenhower, J. B. The First Book of the Antarctic. '57 43:280
Jagger, T. A. Volcanoes Declare War. '45 30:163
Johnson, Gaylord The Story of Earthquakes and Volcanoes. '38 22:331
Joly The Surface History of the Earth. 10:508
Koeppe, Clarence E. Earth and Sun Relations. '34 20:115
Leveson, David A Sense of the Earth. '72 57:245
Linklater, Eric The Voyage of the Challenger. '72 57:241
Lynch, Joseph Our Trembling Earth. '40 25:235
Marmer, H. A. The Sea. '30 16:170-71
Morris, Frederick K. The Making of the Valley. '36 21:53
National Research Council Bulletins Physics of the Earth. '31-'32 17:254

Nininger, H. H. A Comet Strikes the Earth. '46 34:332
Paul, J. Harland The Last Cruise of the Carnegie. '32 16:518
Pearl, Richard M. How to Know the Rocks and Minerals. '55 41:342
Pearl, Richard M. Popular Gemology. '65 51:417
Pearl, Richard M. Rocks and Minerals. '56 41:344
Peattie, Roderick (Editor) The Pacific Coast Ranges. '46 30:310
Price, George McReady Common Sense Geology. '46 33:82
Read, Thomas T. Our Mineral Civilization. '32 17:162
Reinfeld, Fred Picture Book of Rocks and Minerals. '63 50:400
Robinson, Arthur H. Elements of Cartography. '53 38:317
Rosevear, Francis Burr Science Craft Mineralogy Manual. '36 22:334
Schwartz, George M. and Thiel, George A. Minnesota's Rocks and Waters. '54 39:169
Scott, J. M. The Polar Regions. 21:116
Shand, S. J. Earth Lore. '38 23:172
Shand, S. J. The Study of Rocks. '49 34:208
Sherman, Robert C. Life and Death of the Soil. '55 41:239
Shuler, Ellis W. Rocks and Rivers of America. '45 30:55
Simpson Scott's Polar Journey and the Weather. 11:64
Smart, W. M. The Origin of the Earth. '51 35:301
Smith, Chard Powers The Housatonic. '46 30:309-10
Stetson, Harlan True Earth, Radio and the Stars. '34 20:50
Stewart-Remington, John and Francis, Wilfrid The Composition and Assaying of Minerals. '53 38:318
Stommel, Henry Science of the Seven Seas. '45 30:54
Taylor, Griffith Antarctic Adventure and Research. '30 16:170
Vaeth, J. Gordon 200 Miles Up. '55 41:245
Verrill, A Hyatt Minerals, Metals and Gems. '39 24:118
Wahlstrom, Ernest E. Petrographic Mineralogy. '55 41:254
Waters, Frank The Colorado. '46 31: 342
Williams, Henry Smith The Biography of Mother Earth. '31 16:521
Zodac, Peter How to Collect Minerals. '34 20:113

h. Earth Science -- Meteorology (Books for Children)

Bendick, Jeanne Lightning. '61 50:192
Fenton, Carroll Lane and Fenton, Mildred Adams Our Changing Weather. '54 39: 91
Friskey, Margaret The True Book of Air Around Us. 38:112
Lehr, Paul E., Burnett, R. Will and Zim, Herbert S. Weather. '57 41:343
Kinney, Jean What Does the Cloud Do? '67 52:(1)IBC
Larrick, Nancy Rain, Hail, Sleet and Snow. '61 51:414
Meyer, Jerome S. Picture Book of the Weather. '48 33:305
Podendorf, Illa The True Book of Weather Experiments. '61 48:200
Ridgley, Douglas C. Rainfall of the Earth. '33 18:192
Schneider, Herman Everyday Weather and How It Works. '51 36:200
Schneider, Herman and Nina Let's Find Out About the Weather. '56 41:346
Smith, Theresa K. The Fog Is Secret. '66 52:98
Sutton, Felix The How and Why Wonder Book of Our Earth. '60 50:192
Tannehill, Ivan Ray All About the Weather. 41:359
Wyler, Rose The First Book of Weather. 52:(1)IBC
Wyler, Rose The First Book of Weather. '56 43:281-82
Washburn, Stanley, Jr. Nimbo, the Little Cloud that Turned Black. '54 43:85
Zim, Herbert S. Lightning and Thunder. '52 37:271

h. Earth Science -- Meteorology (Books for Adults)

Baer, Marian E. Rain or Shine. '40 25: 175
Battan, Louis J. The Nature of Violent Storms. 52:101
Blair, Thomas A. Weather Elements. '37 22:105
Botley, C. M. The Air and Its Mysteries. '40 25:173
Brooks, Charles Franklin Why the Weather? '35 19:196
Clayton, H. Helm and Clayton, Frances L. World Weather Records. '47 33:79

Felton, Ernest L. California's Many Climates. '65 51:103
Gaer, Joseph Fair and Warmer. '39 25: 173
Hare, F. K. The Restless Atmosphere. '63 52:508
Humphreys, W. J. Ways of the Weather. '43 30:103
Humphreys, W. J. Weather Proverbs and Paradoxes. '34 20:49
Loebsack, Theo Our Atmosphere. 52:514
Longstreth, T. Morris Understanding the Weather. '53 38:255
Luckiesh, Mathew The Book of the Sky. '33 18:189
McEachron, K. B. and Patrick, Kenneth G. Playing with Lightning. '40 25:352
Miller, Denning Wind, Storm, and Rain. '52 37:272
Nakaya, Ukichiro Snow Crystals. '54 41:258
Petersen, William Man--Weather and Sun. '47 34:280
Pickwell, Gayle Weather. '37 22:378
Ridgley, Douglas C. General Circulation of the Atmosphere. '33 18:128
Ridgley, Douglas C. and Koeppe, Clarence E. Fundamentals of Climate. '32 17:344
Scorer, Richard and Wexler, Harry Cloud Studies in Color. '68 53:180
Shaw, Sir Napier The Air and Its Ways. 8:531
Shaw, Sir Napier The Drama of the Weather. '33 18:126
Sloane, Eric Clouds, Air, and Wind. 34:276
Starr, Victor P. Basic Principles of Weather Forecasting. '42 28:55
Tannehill, Ivan Ray Weather Round the World. '43 30:104
Van Straten, Florence W. Weather or Not. '66 53:181
Visher, Stephen Sargent Climate of Indiana. '44 30:103
Visher, S. Climatic Laws. 9:63
Visher, Stephen S. Climatic Atlas of the United States. '54 39:67
World Meteorological Organization, Geneva, Switzerland Marine Science Report No. 1, Global Ocean Research. '70 56: 436-37
Yates, Raymond The Weather for a Hobby. '46 30:314
McGraw-Hill Encyclopedia of Environmental Science. '74 60:129
The Meteorological Glossary. '40 25: 59
Physics of the Earth III: Meteorology. '31 17:349

i. Astronomy (Books for Children)

Barton, William H. and Joseph, Joseph Maron Starcraft. '46 32:50
Bernhard, Hubert J., Bennett, Dorothy A. and Rice, Hugh S. Handbook of the Heavens. '35 19:199
Coles, Robert P. and Frost, Frances Star of Wonder. '53 39:72
Cothren, Marion B. This Is the Moon. '46 32:49
Freeman, Mae and Ira Fun with Astronomy. '53 39:86
Joseph, Joseph Maron and Lippincott, Sarah Lee Point to the Stars. '67 51:413
Kinney, Jean What Does the Sun Do? '67 53:178
Lewellen, John Moon, Sun, and Stars. '54 39:76
Meyer, Jerome S. Picture Book of Astronomy. '45 30:179
Neurath, Marie Let's Look at the Sky. '52 38:115
Proctor, Mary Our Stars Month by Month. '37 23:236
Schneider, Herman and Nina You Among the Stars. '51 36:200
Warner, Gertrude Chandler Star Stories, '47 33:303
White, W. B. Seeing Stars. '35 20:233
Williams, Lou A Dipper Full of Stars. '44 29:281
Wyler, Rose About the Sky. '56 41:354
Wyler, Rose Planet Earth. '52 37:72
Wyler, Rose and Ames, Gerald The Golden Book of Astronomy. '55 41:348
Zim, Herbert S. Comets. '56 41:361
Zim, Herbert S. The Sun. '53 37:290
Zim, Herbert S. The Universe. 52:93

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Abbot, C. G. The Earth and the Stars. '46 31:34
Allen, John Stuart Astronomy: What Everyone Should Know. '45 30:106
Alter, Dinsmore and Cleminshaw, Clarence H. Pictorial Astronomy. '52 37:141
Atlas of the Universe. 52:78

Baker, Robert H. Introducing the Constellations. '37 22:209
Baker, Robert H. The Universe Unfolding. '32 16:339
Baker, Robert H. When the Stars Come Out. '34 19:199
Baldwin, Ralph B. The Face of the Moon. '49 34:337-38
Barton, Samuel G. and Barton, William H. A Guide to the Constellations. '35 19:199
Barton, William H. and Joseph, Joseph Maron Starcraft. '38 22:334
Bedell, A. L. An Album of Celestial Photographs. '46 30:314
Bedell, A. L. Astronomy for Busy People. 30:315
Bok, Bart J. and Bok, Priscilla F. The Milky Way. '45 30:110
Bondi, Hermann The Universe at Large. 52:101
Bova, Ben The New Astronomies. '72 57:105-06
Campbell, Leon and Jacchia, Suigi The Story of the Variable Stars. '45 30:316
Couderc, Paul The Expansion of the Universe. '52 38:241
Davidson, Martin (Editor) Astronomy for Everyman. '53 38:240
Davidson, Martin From Atoms to Stars. '52 38:240
De Sitter, W. Kosmos. '32 18:256
Draper, Arthur L. and Lockwood, Marion The Story of Astronomy. '39 23:295
Duncan, John Charles Essentials of Astronomy. '42 28:111
Dyson, Frank and Woolley, R. Eclipses of the Sun and Moon. '37 23:298
Editorial Staff of Popular Science Monthly Astronomy for Amateurs. '35 22:48
Edwards, Lawrence The Spangled Heavens. '33 18:127-28
Fath, Edward Arthur Through the Telescope. '36 21:49
Fisher, Clyde Exploring the Heavens. '37 22:44
Frost, Edwin Brant Let's Look at the Stars. '35 22:50
Frost, George E. Planets, Stars and Atoms. '39 23:356
Gallant, Roy A. Exploring Mars. '56 43:283
Gallant, Roy A. Exploring the Universe. '56 43:283
Gamow, George The Birth and Death of the Sun. '52 38:241
Gamow, George The Birth and Death of the Sun. '40 25:351
Gamow, George The Moon. '54 39:252
Goldberg, Leo and Aller, Laurence H. Atoms, Stars, and Nebulae. '45 30:315
Grondal The Music of the Spheres. 11:64
Hagner, F. H. What Goes on Around You. '46 31:110
Harding, Arthur M. Astronomy. '35 21:259
Heidi, Fritz Meteorites. '64 48:392
Holman, Jessie B. An Easy Guide to Astronomy. '40 25:354-55
Jeans, Sir James The Mysterious Universe. '30 16:84
Jeans, Sir James The Stars in Their Courses. '31 16:85
Jeans, Sir James The Universe Around Us. '44 28:294
Jennison, R. C. Introduction to Radio Astronomy. '67 53:178
Jones, H. Spencer Life on Other Worlds. '40 25:296
Jones, H. Spencer Worlds Without End. '35 21:56
Key, H. A. The Stars: A New Way to See Them. '52 38:107
Lee, Oliver Justin Beyond Yonder. '39 25:118
Lee, Oliver Justin Measuring Our Universe. '50 34:338-39
Lemon, Harvey Brace Cosmic Rays Thus Far. '36 21:221
Lewellen, John You and Space Neighbors. '53 39:75
Lewis, Isabel Astronomy for Young Folks. '32 18:199
Lum, Peter The Stars in Our Heavens. '48 33:304
MacPherson, Hector Modern Astronomy. 11:289
MacPherson, Hector Modern Cosmologies. '29 14:572
Marshall, Roy K. Sun, Moon, and Planets. '52 38:240
Mayall, R. Newton and Mayall, Margaret L. Skyshooting. '49 34:332
McKready, Kelvin A Beginner's Star Book. '37 22:47
McVittie, G. C. Cosmological Theory. '38 23:177
Messel, H. and Butler, S. T. Space Physics and Radio Astronomy. '64 49:BC
Middlehurst, Barbara M. and Aller, Lawrence H. (Editors) Nebulae and Instellar Matter. '68 53:179
Millikan, Robert A. Cosmic Rays. '39 25:297
Mitchell, S. A. Eclipses of the Sun. '35 20:116
Moseley, Edwin Lincoln Other Worlds. '33 20:188
Moulton, Forest Ray Astronomy. '31 16:171-72
Moulton, Forest Ray Consider the Heavens. '35 21:260
Neely, Henry M. A Primer for Star-Gazers. '46 31:118
Ohring, George Weather on the Planets. '66 51:397
Ordway, Frederick I., III Life in Other Solar Systems. '65 52:507
Payne-Gaposchkin, Cecelia Stars in the Making. '53 38:242

Pendray, G. Edward Men, Mirrors, and Stars. '35 22:43
Pendray, G. Edward Men, Mirrors, and Stars. '46 30:313
Phillips, T. E. R. and Stevenson, W. H. (Editors) Splendour of the Heavens. '31 18:252
Pickering, James Sayre The Stars Are Yours. '53 37:272
Pickering, James S. 1001 Questions Answered About Astronomy. 52:90
Polgreen, John and Cathleen The Stars Tonight. '67 52:89
Reed, W. Maxwell Patterns in the Sky. '51 37:284
Reh, Frank Astronomy for the Layman. '36 21:118
Robinson, John The Universe We Live In. '52 38:241
Russell, Henry Norris The Solar System and Its Origin. '35 22:162
Sedgwick, J. B. Amateur Astronomer's Handbook. '55 41:252
Shapley, Harlow Flights from Chaos. '30 16:172-73
Shapley, Harlow Galaxies. '45 30:316-17
Sidgwick, J. B. Observational Astronomy for Amateurs. '55 41:259
Skilling, W. T. and Richardson, R. S. Sun, Moon and Stars. '46 31:192
Smart, W. M. Astronomy. '37 22:276
Stetson, Harlan True Man and the Stars. '30 16:172
Stetson, Harlan True Sunspots and Their Effects. '37 22:378
Stokley, James Stars and Telescopes. '36 22:48
Thomas, Oswald Heaven and Earth. '30 16:258-59
Woodbury, David O. The Glass Giant of Palomar. '39 24:411
Wylie, C. C. Our Starland. '38 23:114
Williamson, Julia Stars Through Magic Casements. '30 15:72
Wagner, Norton Unveiling the Universe. '36 21:123
Whipple, Fred Earth, Moon and Planets. '46 30:315
Watson, Fletcher G. Between the Planets. '45 30:316
White, Anne Terry All About Stars. '54 41:359
Willis, H. L. The Origin of the Solar System. '46 31:36
Velikovsky, Immanuel Worlds in Collision. '50 34:341-42
Zim, Herbert S. and Baker, Robert H. Stars. '51 37:270

j. Technology — Aviation, Space Travel (Books for Children)

Bendick, Jeanne The First Book of Space Travel. '53 38:114
Beeler, Nelson and Branley, Franklin Experiments with Airplane Instruments. '53 38:111
Burchard, Peter Balloons from Paper Bags to Skyhooks. '60 50:191
Corbett, Scott What Makes a Plane Fly? '67 52:100
Fraser, Chelsea The Model Aircraft Builder. '31 16:252
Harney, Laura B. The Skycraft Book. '32 16:434
Lewellen, John You and Space Travel. '51 38:112
Neurath, Marie Rockets and Jets. 38: 115
Post, Augustus Skycraft. '33 18:196
Reiner, William The Flying Rangers. '54 39:76

j. Technology — Aviation, Space Travel (Books for Adults)

Black, Archibald The Story of Flying. '40 25:117-18
Burnett, R. Will Operation Moon. '55 40:80
Carlisle, Norman, Cleveland, Reginald and Wood, Jonathan The Modern Wonder Book of the Air. '45 30:107
Caidin, Martin Destination Mars. '72 57:97-98
Coombs, Charles Skyrocketing into the Unknown. '54 39:244
Devon, Francis The Story of the Helicopter. '46 30:301-02
Francis, Devon Aviation. '45 30:173
Fraser, Chelsea The Story of Aircraft. '33 20:187
Gatland, Kenneth W. and Kunesch, Anthony M. Space Travel. '53 39:245
Horsley, Terence Soaring Flight. '46 30:302
Hylander, C. J. Flying Power. '43 30: 250
Joseph, Alexander Rockets into Space. '55 43:85
Ley, Willy Missiles, Moonprobes, and Magaparsecs. '64 52:514

Leyson, Captain Burr W. Man, Rockets, and Space. '54 39:244
Menzel, Donald H. Flying Saucers. '53 38:242
Poole, Lynn Your Trip into Space. '53 39:245
Ray, Jim The Story of American Aviation. '46 30:173
Smith, Maurice (Editor) Flight Handbook. '55 40:162
Vallee, Jacques and Janine Challenge to Science: The UFO Enigma. '66 53:181
Williams, Archibald Conquering the Air. 11:212
Zim, Herbert S. Rockets and Jets. '45 29:219

k. General Technology (Books for Children)

Pease, Josephine Van Dolzen It Seems Like Magic. '46 31:108
Reynolds, Rollo G. (Editor) Our Changing World. 21:215

k. General Technology (Books for Adults)

Bonnell, Allen T. and Christman, Ruth C. (Editors) Industrial Science. '52 38:325
Cressy, Edward Discoveries and Inventions. '30 14:572
Hatfield, H. Stafford The Inventor and His World. '33 18:55
Leonard, Jonathan Norton Tools of Tomorrow. '35 19:195
Leyson, Captain Burr W. Modern Wonders and How They Work. '49 34:331
Leyson, Captain Burr W. More Modern Wonders and How They Work. '52 38:256
Nida, William L. Man Conquers the World with Science. '34 21:117
Polakov, Walter N. The Power Age. '33 19:85
Weidlein, Edward R. and Hamor, William A. Glances at Industrial Research. '36 21:211
Wheeler, Harold (General Editor) Marvels of the Modern World. '40 25:176
Yates, Raymond F. Machines Over Men. '39 24:407

3. Genreal Science (includes topics common to all sciences, e.g., research, and books about several sciences)
a. Bibliographies and Dictionaries

American Chemical Society Selected Titles in Chemistry--An Annotated Bibliography of Moderately Priced Books for the Student, the Teacher, and the General Reader. '72 56:583-84
Arnett, Ross H., Jr. Books on Zoology. '56 42:96
Blackwood, Paul E. Science Experiment Books for Children; Experiments in Elementary Science. 37:268
Bureau of Curriculum Research A Selected Bibliography in Elementary Science. '55 41:346
Callahan, Ludmilla I. Russian-English Technical and Chemical Dictionary. '47 32:220
Deason, Hilary J. A Guide to Science Reading. '66 53:176
Gordon, Eva L. A Bibliography of Nature Study. '39 24:177
Guerrero, Antonio Perol New Technical and Commercial Dictionary. '42 27:51
Langvick, Mina M. and Noll, Victor H. U.S. Government Publications Useful to Teachers of Science. '32 18:124
Light, Israel Annotated Bibliography on Atomic Energy. '47 32:219
Mallinson, George Griesen and Mallinson, Lois Marion A Bibliography of Reference Books for Elementary Science, 1952. '52 37:268
Mallinson, George Griesen and Mallinson, Jacqueline Buck A Bibliography of Reference Books for Elementary Science. 50:192
National Cancer Institute Reading on Cancer: An Annotated Bibliography. '55 42:183
New Jersey Library Association Meet the Sciences. '51 37:141
Osborne, A. K. An Encyclopedia of the Iron and Steel Industry. '56 42:95
Pack, Arthur M. and Palmer, Laurence C. The Nature Almanac. 12:493
Patterson, Austin M. A German-English Dictionary for Chemists. '50 34:342
Rakestraw, Norris W. Journal of Chemical Education, 25-Year Cumulative Index. Vols. 1-25. 1924-1949. '52 38:249

Rockcastle, Verne N. and Gordon, Eva L. Science Books for Children. '57 44: 152, 54
Schwartz, Julius and Schneider, Herman Growing up with Science Books. '59 44:152
Steckler, Phyllis B. American Scientific Books, 1960-1962. 52:518
Tweney, C. F. and Hughes, L. E. C. Chamber's Technical Dictionary. '40 25:295
Vinal, William Gould Nature Education: A Selected Bibliography. '34 20:110
Webb, Hanor A. The High School Science Library for 1928-1929. 14:384
Webb, Hanor A. The High-School Science Library for 1936-1937. '37 21:224
Webb, Hanor A. The High-School Science Library for 1939-40. '40 25:167
Williams, Alice Marietta Children's Choices in Science Books. '39 24: 177
Woodring, Oakes and Brown Enriched Teaching of Science in the High School. '28 13:186
Bibliography of Material on Animal Experimentation. '54 39:250
Catalog of Technical Books. 27:155
Encouraging Future Scientists: Materials and Services Available in 1955-56. '55 40:79
Science Booklists for Boys and Girls. 23:112

b. Books for Children

Abbott, Charles G. Everyday Mysteries. 8:450
Bendick, Jeanne All Around You. '51 37:145
Broekel, Ray You and the Sciences of Plants, Animals, and the Earth. '56 41:367
Brown, Vinson How to Make a Home Nature Museum. '54 39:88
Coffman, Ramon Peyton The Child's Story of Science. 24:180
Davis, Watson Science Picture Parade. '40 25:178
Harrison, Caroline and Washburn, Bradford Allen and Trisha Visit the Science Park. '53 37:277
Harrison, Lucia Daylight, Twilight, Darkness and Time. '35 19:137
Herbert, Don Mr. Wizard's Science Secrets. '52 37:282
Ilin, M. 100,000 Whys. '33 18:188
Jaeger, Ellsworth Land and Water Trails. '53 39:241
Larrick, Nancy See for Yourself: A First Grade Book of Science Experiments. '52 37:292
Lindberg, G. and M. Our Amazing World. '68 52:510-11
Lynde, Carleton John Science Experiences with Home Equipment. '37 21:258
Lynde, C. J. Science Experience with Inexpensive Equipment. '39 23:291
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1	1916-17	W. G. Whitman	4	248	42	13	
2	1917-18	W. G. Whitman	4	236	29	15	
3	1918-19	W. G. Whitman	4	256	29	25	
4	1919-20	W. G. Whitman	4	263	28	18	
5	1920-21	W. G. Whitman	4	276	26	14	
6	1921-22	W. G. Whitman	4	308	40	30	
7	1922-23	W. G. Whitman	4	310	21	37	
8	1923-24	W. G. Whitman	4	307	25	48	
9	1924-25	W. G. Whitman	4	288	28	51	
10	1925-26	O. E. Underhill	4	311	20	51	
11	1926-27	W. G. Whitman	4	304	22	68	
12	1927-28	W. G. Whitman	4	280	23	89	
13	1928-29	W. G. Whitman	4	292	34	52	
14	1929-30	C. J. Pieper*	4	366	35	69	27
15	1930-31	C. J. Pieper	4	278	31	45	56
16	1931-32	C. J. Pieper	6	527	52	173	186
17	1933	C. J. Pieper	4	354	39	134	151
18	1934	C. J. Pieper	4	262	41	198	176
19	1935	C. J. Pieper	4	200	27	97	268
20	1936	C. J. Pieper	4	236	35	191	147
21	1937	C. J. Pieper	5	260	31	222	180
22	1938	C. J. Pieper	7	380	53	326	288
23	1939	C. J. Pieper	7	398	56	237	344
24	1940	C. J. Pieper	7	414	70	222	250
25	1941	C. J. Pieper	7	412	68	283	256
26	1942	C. J. Pieper	5	220	31	104	205
27	1943	C. J. Pieper**	4	156	30	83	78
28	1944	Publication Comm.	5	298	57	56	38
29	1945	S. R. Powers	5	282	36	41	21
30	1946	C. M. Pruitt	5	328	39	221	59
31	1947	C. M. Pruitt	5	349	48	206	25
32	1948	C. M. Pruitt	5	389	44	285	120
33	1949	C. M. Pruitt	5	385	52	165	45
34	1950	C. M. Pruitt	5	351	50	270	
35	1951	C. M. Pruitt	5	308	52	109	
36	1952	C. M. Pruitt	5	319	47	113	
37	1953	C. M. Pruitt	5	355	39	206	
38	1954	C. M. Pruitt	5	438	35	422	
39	1955	C. M. Pruitt	5	415	40	342	
40	1956	C. M. Pruitt	5	412	59	57	
41	1957	C. M. Pruitt	5	449	60	462	
42	1958	C. M. Pruitt	5	480	78	50	
43	1959	C. M. Pruitt	5	470	77	108	
44	1960	C. M. Pruitt	5	420	69	32	
45	1961	C. M. Pruitt	5	485	93	0	
46	1962	C. M. Pruitt	5	505	81	0	
47	1963	C. M. Pruitt	5	515	90	9	
48	1964	C. M. Pruitt	5	498	74	17	
49	1965	C. M. Pruitt	5	504	90	47	
50	1966	C. M. Pruitt	5	502	92	30	

VOLUME	YEAR	EDITOR	ISSUES	PAGES	FULL ARTICLES	BOOK REVIEWS	ABSTRACTS
51	1967	C. M. Pruitt	4	520	91	97	
52	1968	C. M. Pruitt	5	528	74	306	
53	1969	N. E. Bingham#	5	442	88	53	
54	1970	N. E. Bingham	4	397	73	4	
55	1971	N. E. Bingham	4	598	74	18	
56	1972	N. E. Bingham	4	592	66	39	
57	1973	N. E. Bingham	4	564	54	51	
58	1974	N. E. Bingham	4	603	63	13	
59	1975	N. E. Bingham	5##	675	66	4	
60	1976	N. E. Bingham	5##	685	57	16	
		TOTALS		23203	3074	6744	2920

*Served as Chairman of the Editorial Board beginning with Vol. 13, no. 4, May 1929. The journal's name was changed from General Science Quarterly to Science Education with the May 1929 issue.

**Served as Editor through Vol. 27, no. 2, September-October 1943. Beginning with the November 1943 issue, the journal was published under the direction of the Committee of Publication (W. G. Whitman, Chairman) through Vol. 28, no. 4, October 1944, when S. R. Powers became Editor.

#Appointed as editor beginning with Vol. 52, no. 5, December 1968.

##Includes four regular issues plus "A Summary of Research in Science Education," containing 85 pages in volume 59 and 99 pages in Volume 60.